#1

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Position correcting device for Substrate for Liquid Crystal

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CLAIMS

[Claim(s)]
[Claim 1] A location compensator in a processor of a substrate for liquid crystal which has stationed a robot for carrying in and taking out said substrate to a cassette which can contain two or more substrates for liquid crystal characterized by providing the following A side edge position transducer for detecting a side edge location of said substrate in a position in the condition that said robot took out said substrate from said cassette, while forming the direction regulation means of a transverse plane for once pushing in said substrate from a transverse-plane side of said cassette at the time of taking out of said substrate, and arranging the direction of a transverse-plane side of said substrate in the predetermined direction in said robot's hand section An operation means to calculate the amount of bias from a criteria location of a side edge location of said substrate by considering an output of said side edge position transducer as an input, and to obtain location amendment data Robot control equipment which amends future conveyance location data with location amendment data of said operation means
[Claim 2] Said side edge position transducer consists a sensor which outputs a binary signal by existence of said substrate of what prepared 1 or more sets of said substrate in a location of bilateral symmetry centering on a criteria location of a side edge when pulling out from said cassette. and the 1st set of said sensor -- a criteria location to **deltaYo a location -- moreover, it is set to 2 and deltaYo >=deltaY after the 2nd set -- it set beforehand -- whenever it deltaY is far apart -- an n-tuple -- however The natural number of n>=(Ymax-deltaYo)/(2 and deltaYo), and Ymax = 1/2 of a difference of inner width of face of a substrate stowage of said cassette, and substrate width of face, the amount of allowance bias of a deltaYo = substrate side edge location, ******, Said operation means between said sensors of the m-th set and sensors of eye a ** (m-1) group Value deltam which satisfies 2, deltaYo+ (m-2), delta Y>=delta m >= (m-1), and deltaY when it detects that there is a side edge of said substrate and which was defined beforehand A location compensator of a substrate for liquid crystal according to claim 1 outputted as said side edge location amendment data.
[Claim 3] Said side edge position transducer is the location compensator of a substrate for liquid crystal according to claim 1 which is the sensor which detects quantitatively the amount of bias from said criteria location of a side edge location of said substrate.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] In case this invention conveys the substrate for liquid crystal inside the manufacture process unit of liquid crystal, it needs to amend the gap produced in the center position and hand of cut of a substrate, to realize conveyance of the substrate to the proper location of a process unit, and the safe receipt to a cassette, and to prevent defective generating on a process, and destruction of a substrate.
[0002]
[Description of the Prior Art] The substrate for liquid crystal controls liquid crystal by the transistor which vapor-deposited the thin film with various process units, or etched, formed the required transistor on the surface of the glass plate, and was formed in this substrate front face, controls the permeability of the light from a substrate rear face, and makes it the structure on which an alphabetic character and a graphic form are displayed. Vacuum evaporationo and etching processing of these thin films are instrumentated for every process, call, and process. Generally these substrates for liquid crystal are carrying out the rectangle, and the magnitude is in a buildup inclination every year, and is manufactured to the about [current 500mmx600mmx0.7t] thing.
[0003] On the other hand, these substrates are contained per about ten sheets by the substrate receipt case generally called a cassette, and between [various] process units are transported in this cassette unit. The transported substrate is picked out from a cassette with conveyance machines, such as a robot of various process units, is conveyed inside equipment, and required processing is carried out. moreover, it returns to a cassette with a conveyance machine again after processing termination -- having -- the equipment of a degree -- ** -- it is transported.
[0004] [Conventional example 1] drawing 9 shows the conceptual diagram of the manufacture process unit of the common substrate for liquid crystal, in 1, a robot and 2 show a cassette, 3 shows a substrate, and 12 shows the processing room of this substrate. The substrate contained by the cassette is conveyed by the robot 1 at the processing room 12, and is again recovered inside the previous cassette 2 or another cassette which is not illustrated by the robot 1 after the completion of processing. Here, it is necessary to install the conveyed substrate with a sufficient precision in the position of the processing interior of a room. However, with the configuration of drawing 9 , since a carrier robot only operates between the locations taught beforehand, he will be conveyed with location gap of each substrate produced inside the cassette included, and will be carried in to a processing room or a cassette.
[0005] Since it has the positioning device of the cassette itself to these equipments, to them, the location of a cassette is exact, but the width of face for in-and-out of a substrate is more greatly made a little by the cassette from the width of face of a substrate, and since the substrate in a cassette may have gap of a center position and a hand of cut to a cassette, it can be called imperfection only by the positioning device of a cassette.
[0006] When a cassette is transported to equipment, it is that the internal substrate was not located at the center of a cassette, but has stopped in one of the edges of a cassette in most cases. If the center of a cassette and the center of a substrate usually do not suit, the location is shifting and carrying out the internal substrate in many cases and a substrate is conveyed in ejection and the processing room of a process unit from a cassette as it is with a robot It may not be well set to the processing room inside equipment by location gap of a substrate, and when extreme, it may also happen that a substrate contacts

equipment and is damaged.
[0007] Then, the location amendment device shown in drawing 10 as a means for correcting this location gap is established. It is a device for facing a substrate of 3 with a pusher, and, as for 2, 23 facing across the right-and-left ends of a substrate 3 by the cassette, in drawing 10 , and carrying out alignment of the longitudinal direction of a substrate, for example, the pusher on either side was connected with the rack and pinion, while is connected with a driving source like a cylinder. The window part required in order, as for the right-and-left ends of a cassette, to pinch this pusher's substrate is prepared. If a cylinder works now, a pusher on either side moves to a substrate side uniformly, and pushes the substrate. If the only larger gap than the longitudinal-direction width-of-face size of a substrate when a pusher stops is taken, it will mean that the location of the longitudinal direction of all the substrates in a cassette was amended.
[0008] [Conventional example 2] drawing 11 is the external view showing the example of another conventional technology, it detects the center position of a substrate and the gap of a hand of cut which were produced inside the cassette by the sensor, shifts from the detection value of a sensor, calculates an amount, drives the table which put the substrate according to the result of an operation, and amends gap.

[0009] In drawing 11 , a robot and 2 show a cassette, 3 shows a substrate, and after 1 conveys a substrate 3 to a pointing device 14 and positions it by the robot 1 here, it conveys it in the processing room 12. A pointing device 14 has the sensor which detects each edge of right and left of a substrate 2, and a cross direction while being equipped with the driving source which moves the turntable which adsorbs a substrate 2 and is revolved, and a turntable to right and left and a cross direction. Three components delta X and delta Y of gap from the criteria location of a substrate and angle-of-rotation deltatheta are computed by these sensors, angle-of-rotation deltatheta is first corrected on a turntable, and delta X and delta Y are amended in a turntable driving source after that. (For example, JP,7-33232,A)
[0010]
[Problem(s) to be Solved by the Invention] Since it was only location amendment of a longitudinal direction when based on the equipment of drawing 9 and drawing 10 , when transporting a cassette to a liquid crystal manufacture process unit for location amendment of a cross direction, after arranging the location of the end face of a substrate when an operator once leans a cassette by human power in order to arrange a cross direction, it had to install in the cassette base of equipment. Moreover, by this method, in order for the force to join the ends of a glass substrate mechanically, a chip (chipping) occurs on the edge of a substrate and it becomes the cause of the crack of a substrate, and whenever a chipping piles up a process, it not only worsens the yield, but it grows. For this reason, if a crack occurs in a final process, all the processes till then will become useless and will become huge [loss]. Moreover, dust will be generated for a contact process and this dust will make a fatal defective. Furthermore, since the weight of a cassette was a help and it forced to actuation of alignment further the thing hard [just to be and to carry no less than about tenkg], it included danger, such as a failure and an actuation failure.
[0011] Moreover, in the thing of the method of drawing 11 , although the trouble of the method of above-mentioned drawing 9 and drawing 10 was solvable, in order to amend location gap, considerable long time amount was needed and there was a problem that conveyance effectiveness fell.
[0012]
[Means for Solving the Problem] In a location compensator in a processor of a substrate for liquid crystal which has stationed a robot for carrying in and taking out a substrate to a cassette by which this invention can contain two or more substrates for liquid crystal While forming the direction regulation means of a transverse plane for once pushing in a substrate from a transverse-plane side of a cassette at the time of taking out of a substrate, and arranging the direction of a transverse-plane side of a substrate in the predetermined direction in a robot's hand section A side edge position transducer for detecting a side edge location of a substrate in a position in the condition that a robot took out a substrate from a cassette, It is the location compensator of a substrate for liquid crystal possessing an operation means to calculate the amount of bias from a criteria location of a side edge location of a substrate by considering an output of a side edge position transducer as an input, and to obtain location amendment data, and robot control equipment which amends future conveyance location data with location amendment data of this operation means.
[0013]

[A mode of implementation of invention] Drawing 1 is the perspective diagram showing an example of equipment of this invention. In this drawing, 1 is a substrate with which a robot for substrate conveyance and 2 are contained by cassette, and several many 3 is contained by cassette 2. A main part 12 is laid on a robot's 1 base 11, and it has the hand section 15 for adsorbing an arm 14 and a substrate 2 which were attached in the horizontally pivotable fixed pivot [go up and down / it / to a Z direction of drawing] 13, and a fixed pivot 13, and conveying them on a main part 12. An arm 14 is mutually connected pivotable like a graphic display, cooperates with a fixed pivot 13 and moves XY flat-surface (level surface) top of drawing for a hand 15. Moreover, gage pins 16a and 16b are formed in a hand 15, when it inserts into a cassette 2, a transverse-plane edge of a substrate 3 is pushed in, and it regulates so that a transverse-plane edge of a substrate 3 may become in parallel to the direction of Y. When a substrate 3 is pulled out from a cassette 3 by hand 15 to a robot's 1 fixed pivot 13, the side edge position transducer 17 is attached in a location at which a side edge of a substrate 3 arrives, and when a substrate is pulled out by this side edge position transducer 17, the sensor 18 which detects bias from a criteria location in which that side edge should be located is formed.

[0014] In equipment of this drawing, actuation when picking out a substrate 3 from a cassette 2 is explained with a flow chart of drawing 2 . A robot's 1 fixed pivot 13 is first moved to a Z direction, and a hand 15 is doubled with height which takes out a target substrate. Next, a hand 15 is inserted in the bottom of a substrate of an aim in a cassette 2, with this height maintained. At this time, if a hand 15 is inserted to a predetermined location into a cassette 2, a substrate will be regulated between gage pins 16a and 16b and back end sides of a cassette 2 which were established in a hand 15, and the direction of the front end of a substrate 3 (end face by the side of a transverse plane) will be arranged in the direction of Y of drawing in parallel. According to an adsorption device which is not illustrated after raising a hand 15 for a while in this condition and dipping up a substrate 3, adsorption immobilization of the substrate is carried out and it pulls out to the exterior of a cassette 2. When the direction of a cash drawer is made into the direction of X of drawing which met in the direction of an outlet of a cassette 2 and is pulled out thoroughly, it is made for a side edge of a substrate to serve as a location which stands face to face against the side edge position transducer 17 at this time. Where a hand 15 is pulled out thoroughly, a side edge location of a substrate is judged according to an output state of the sensor 18 of the side edge position transducer 17, and it is amount of amendments deltan of the direction of Y. It determines and conveyance data to a process unit 4 is amended.

[0015] Drawing 3 is drawing showing a condition when pulling out thoroughly the hand 15 which adsorbed a substrate 3 from a cassette 2, this drawing (a) is a plan and this drawing (b) is a side elevation. In this drawing, each sign has given a same sign to a thing of drawing 1 and this function.

[0016] Moreover, drawing 4 is the plan showing an example of the side edge position transducer 17 of equipment shown in drawing 1 and drawing 3 . In the case of this drawing, it is a sensor a1 to the criteria location C in which it should be located when a side edge of a substrate 3 is normal. Or an And sensor b1 Or bn It is attached in bilateral symmetry, respectively. It is a sensor a1 here. b1 It is amount of allowance bias deltaYo to the criteria location C. It separates and is a sensor a2. Or an And b2 Or bn It is a gap deltaY1, respectively. Or deltaYn-1 It is attached in a distant location like a graphic display. Each sensor outputs ON, 1 [i.e.,], or a high-level signal, when a substrate exists in each upper part, and when a substrate does not exist, it uses what outputs a binary-logic signal used as OFF, 0 [i.e.,], or a low-level signal (or signal of relation of these reverse).

[0017] It sets to a side edge position transducer with which a sensor was formed like drawing 4 , and is the distance Ym from the criteria location C to the m-th sensor. Ym =deltaYo+deltaY1+ -- It can express with +deltaYm-1. When a robot's 1 hand 15 adsorbs a substrate 3 and reaches from a cassette 2 to a location of a cash drawer and drawing 3 in drawing 1 now, it is the m-th sensor bm of drawing 4 . Supposing all left-hand side sensors are detecting a substrate For the side edge location Y of a substrate 3, are in a method of the right [location / C / criteria] in the range of Ym-1 <=Y<=Ym, namely, a side edge of a substrate is sensor bm-1. Sensor bm It can distinguish that it is in between. It carries out also here and is Sensor bm. When a side edge of a substrate is in the latest location, it is tolerance a1, i.e., a sensor, about this. b1 Amount of location amendments deltam for making it move in between is Ym+deltaYo >=deltam >=Ym-deltaYo.... It must be (1).

[0018] Moreover, sensor bm-1 When a side edge location of a substrate is located in the latest location, it is amount of location amendments deltam. Ym-1+deltaYo >=deltam >=Ym-1-deltaYo .... It must be (2). So, sensor bm Sensor bm-1 Amount of location amendments deltam for moving this to tolerance,

when a side edge location of a substrate is in between (1) A formula and (2) Ym-1+deltaYo >=deltam >=Ym-deltaYo in which both formulas are materialized .... What is necessary will be just to determine in (3).
[0019] Furthermore, it is (3). In order to materialize a formula, it is required to materialize Ym-1+deltaYo >=Ym-deltaYo. It is 2 and deltaYo >=Ym-Ym-1 from this.... It is set to (4) and is the above (3). A formula and (4) It is allowable-error deltaYo about amount of location amendments deltam, and a mounting pitch of a sensor to a suitable value with which are satisfied of a formula. What is necessary is to receive and just to set.
[0020] here -- temporary -- sensor a1 Or an And b1 Or bn supposing it installs by regular-intervals deltaY -- (3) a formula -- {deltaYo+(m-2) -deltaY}+deltaYo >=deltam -- and -- deltam >={deltaYo+(m-1) -deltaY}-deltaYo -- that is 2, deltaYo+ (m-2), delta Y>=delta m >= (m-1), and deltaY .... (5) [0021] Moreover, (4) A formula is 2 and deltaYo >=deltaY. .... It can simplify with (6).
[0022] Next, when a difference of an inside width-of-face size of a cassette 2 and width of face of a substrate 3 is set to L, when there is location gap of a substrate in the crosswise center about a criteria location then, it will be settled in each right and left less than a maximum of L / 2. now and drawing 5 -- like -- this amount of the maximum gaps -- right and left from the criteria location C -- every -- L / 2=Ymax ** -- carrying out -- during this period -- respectively -- n sensors (however, natural number of n>=1) -- preparing -- a sensor of the n-th piece to the amount Ymax of the maximum gaps distance to a location -- deltaYmax **, if it carries out Ymax =Yn+deltaYmax =(deltaYo+deltaY1+ -- +deltaYn-1) +deltaYmax It becomes.
[0023] The here above-mentioned (4) Considering formation conditions in case a side edge location of a substrate is located like the time of ******** in a formula on the outside of a sensor of the n-th piece, they are 2 and deltaYo >=Ymax-Yn as m=n. .... (7) to 2, and deltaYo >=deltaYmax .... (8) and formula (4) is materialized -- as -- mounting pitch deltaY of a sensor, and deltaYmax a value -- setting -- these -- responding -- amount of location amendments deltan (3) What is necessary will be just to set according to a formula.
[0024] Furthermore, it is a sensor a1. And b1 When henceforth is installed by regular-intervals deltaY, respectively, it is Ymax =deltaYo+(n-1) delta Y+delta Ymax.... It is set to (9). (9) deltaY of a formula, and deltaYmax (6) types -- and -- if (8) types are applied -- Ymax <=deltaYo+ (n-1), 2, deltaYo+2, and deltaYo since it becomes -- n>=(Ymax-deltaYo)/(2 and deltaYo) .... It is set to (10).
[0025] so -- a time of installing a sensor by regular-intervals deltaY -- (6) A formula thru/or (8) and (10) types are satisfied -- as -- the number n of each sensor on either side, mounting pitch deltaY, and deltaYmax setting -- this -- responding -- amount of location amendments deltam (5) What is necessary will be just to set according to a formula.
[0026] If the number of sensors is made to increase so that the above-mentioned explanation may show, it will be allowable-error deltaYo. Although precision of location amendment can be raised since it can set up small A position error can be set to less than 1mm when the maximum amount of location gaps forms [actually] two sensors at a time in right and left from a criteria location to a criteria location at bilateral symmetry also in a certain time 4mm (a difference of an inside width-of-face size of a cassette and width of face of a substrate is 8mm), respectively.
[0027] That is, it is (6) when allowable-error deltaYo =1mm and Ymax =4mm. deltaY<=2 and deltaYo of a formula Mounting pitch deltaY of a sensor should just be deltaY<=2mm.
[0028] Moreover, distance deltaYmax to a location to which a side edge location of a substrate may come from a sensor of the maximum outside (8) It is set to 2x1 >=deltaYmax from a formula.
[0029] Moreover, when it sets with Ymax =4 and deltaYo =1 in (10) types, it is set to n>= (4-1)/2 and 1, and it turns out [n>=1.5, then] that it is good.
[0030] So, it is each sensor, when adopting n= 2 and installing every two sensors each in bilateral symmetry centering on the criteria location C (a). deltaYo =1mm, deltaY=2mm, deltaYmax =1mm, or (b) What is necessary is just to set up like deltaYo =1mm, deltaY=1.5mm, and deltaYmax =1.5mm.
[0031] Drawing 6 is the plan showing an example of the side edge position transducer 17 when performing it above, and is a1 and a2 to bilateral symmetry centering on the criteria location C. And b1 and b2 Two sensors each are formed. In addition, it sets to this drawing and is amax. And bmax A side edge location, i.e., Ymax, when the maximum gap ****** of the substrate is carried out A location is shown.
[0032] Next, the above (a) and amount of amendments deltam in each **** of (b) A decision method is

explained.
[0033] In (a), it is (i). Sensor a1 And a2 A substrate is detected and it is a sensor b1. And b2 While not detecting, a side edge location of a substrate is a sensor a1. b1 It is in between, and since it is in an allowable error, it is referred to as amount deltam =deltaof amendments1 =0.
(ii) Sensor a2 It is accepted, and a substrate is detected or it is a sensor a1 and a2. And b1 It is detecting and is a sensor b2. While not detecting, a side edge location of a substrate is a sensor a1. a2 Between or sensor b1 b2 It is in either of between. (3) Since it is m= 2, deltaYo =1, Ym-1 =deltaYo =1, and Ym =deltaYo+deltaY=1+2=3 in a formula, it is the amount delta 2 of amendments. (3) These are substituted for a formula, it is set to 1+1 >=delta2 >=3-1, and it turns out [amount deltaof amendments2 =2mm then] that it is good. moreover, the amendment direction -- sensor a1 a time of detecting a substrate -- Y2 of drawing a direction -- a sensor a1 and a2 And b1 a time of detecting a substrate -- Y1 of drawing a direction -- then, it is good. [moreover,]
(iii) A sensor a1, a2, b1, and b2 While all are detecting whether all are detecting a substrate, a side edge location of a substrate is a sensor a2. Or b2 It is outside. Therefore, (3) Since it is m= 3, deltaYo =1, Ym-1 =3, and Ym =Ymax =4 in a formula, they are these (3) When it substitutes for a formula, it is set to 3+1 >=delta3 >=4-1, and is the amount delta 3 of amendments. It turns out that what is necessary is just to set to a suitable value in 3-4mm. Moreover, the amendment direction is Y1 of drawing, while all sensors are detecting a substrate. While all sensors are not detecting a substrate to a direction again, it is Y2 of drawing. What is necessary is just to consider as a direction.
[0034] In (b), it is (i). Sensor a1 And a2 A substrate is detected and it is a sensor b1 and b2. While not detecting, a side edge location of a substrate is a sensor a1. b1 It is in between, and since it is in an allowable error, it is referred to as amount deltam =deltaof amendments1 =0.
(ii) Sensor a2 It is accepted, and a substrate is detected or it is a sensor a1 and a2. And b1 It is detecting and is a sensor b2. While not detecting, a side edge location of a substrate is a sensor a1. a2 Between or sensor b1 b2 It is in either of between. (3) Since it is m= 2, deltaYo =1, Ym-1 =deltaYo =1, and Ym =deltaYo+deltaY=1+1.5=2.5 in a formula, it is the amount delta 2 of amendments. (3) It turns out that what is necessary is to substitute these for a formula, to be set to 1+1 >=delta2 >=2.5-1, and just to set to a suitable value in 2 >=delta2 >=1.5. Moreover, what is necessary is just to define the amendment direction according to an output state of each sensor like the time of the above (a).
(iii) A sensor a1, a2, b1, and b2 While all are detecting whether all are detecting a substrate, a side edge location of a substrate is a sensor a2. Or b2 It is outside. (3) Since it is m= 3, deltaYo =1, Ym-1 =3, and Ym =Ymax =4 in a formula, they are these (3) If it substitutes for a formula, it will be set to 2.5+1 >=delta3 >=4-1, and it is the amount delta 3 of amendments. It turns out that what is necessary is just to set to a suitable value in 3-3.5mm. Moreover, what is necessary is just to define the amendment direction according to an output state of each sensor like the time of the above (a).
[0035] If the above is summarized, it will become like drawing 7 and drawing 8 .
[0036] So, define data of drawing 7 or drawing 8 beforehand, and it is made to memorize corresponding to a mounting condition of a sensor. When a substrate is pulled out by a robot's 1 hand 15, a side edge location can be judged according to the condition that each sensor of the side edge position transducer 15 detected a substrate in a cash-drawer location, and the amount of amendments of the direction of Y and the amendment direction can be promptly acquired by reading data memorized previously. If this amount of amendments is considered and it is made to move when conveying a substrate from this result to the following process unit, a substrate will be installed correctly.
[0037] Although an existence range like a side edge of a substrate was judged with a binary-logic signal of whether two or more sensors were installed in bilateral symmetry centering on a criteria location, and each sensor detected a substrate, you may make it detect quantitatively the amount of gaps from a criteria location of a side edge of not only a thing of such a method but a substrate as a side edge position transducer in the above-mentioned example. In this case, if a thing and a CCD sensor which are called a line sensor from which an output changes to a side edge position transducer to change of a substrate's existence location at a linear are used, since the amount of amendments can be directly obtained as a difference of these outputs and reference values, positioning of high degree of accuracy will still be attained.
[0038]
[Effect of the Invention] In case a substrate is conveyed in the processing room in a liquid crystal manufacture process unit in this invention, are full automatic in gap of the substrate produced inside the

cassette. And since it can amend without completely requiring time amount for location detection While being able to press down generating of the chipping which causes a crack of a ******** substrate on a problem conventionally, and dust to the minimum, it becomes unnecessary [the alignment by the help] and an effect remarkable in the improvement in efficiency of production of a liquid crystal substrate, the improvement in the yield, and improvement in reliability is acquired.

[Translation done.]

TECHNICAL FIELD

[Industrial Application] In case this invention conveys the substrate for liquid crystal inside the manufacture process unit of liquid crystal, it needs to amend the gap produced in the center position and hand of cut of a substrate, to realize conveyance of the substrate to the proper location of a process unit, and the safe receipt to a cassette, and to prevent defective generating on a process, and destruction of a substrate.

[Translation done.]

PRIOR ART

[Description of the Prior Art] The substrate for liquid crystal controls liquid crystal by the transistor which vapor-deposited the thin film with various process units, or etched, formed the required transistor on the surface of the glass plate, and was formed in this substrate front face, controls the permeability of the light from a substrate rear face, and makes it the structure on which an alphabetic character and a graphic form are displayed. Vacuum evaporationo and etching processing of these thin films are instrumentated for every process, call, and process. Generally these substrates for liquid crystal are carrying out the rectangle, and the magnitude is in a buildup inclination every year, and is manufactured to the about [current 500mmx600mmx0.7t] thing.

[0003] On the other hand, these substrates are contained per about ten sheets by the substrate receipt case generally called a cassette, and between [various] process units are transported in this cassette unit. The transported substrate is picked out from a cassette with conveyance machines, such as a robot of various process units, is conveyed inside equipment, and required processing is carried out. moreover, it returns to a cassette with a conveyance machine again after processing termination -- having -- the equipment of a degree -- ** -- it is transported.

[0004] [Conventional example 1] drawing 9 shows the conceptual diagram of the manufacture process unit of the common substrate for liquid crystal, in 1, a robot and 2 show a cassette, 3 shows a substrate, and 12 shows the processing room of this substrate. The substrate contained by the cassette is conveyed by the robot 1 at the processing room 12, and is again recovered inside the previous cassette 2 or another cassette which is not illustrated by the robot 1 after the completion of processing. Here, it is necessary to install the conveyed substrate with a sufficient precision in the position of the processing interior of a room. However, with the configuration of drawing 9 , since a carrier robot only operates between the locations taught beforehand, he will be conveyed with location gap of each substrate produced inside the cassette included, and will be carried in to a processing room or a cassette.

[0005] Since it has the positioning device of the cassette itself to these equipments, to them, the location of a cassette is exact, but the width of face for in-and-out of a substrate is more greatly made a little by the cassette from the width of face of a substrate, and since the substrate in a cassette may have gap of a center position and a hand of cut to a cassette, it can be called imperfection only by the positioning device of a cassette.

[0006] When a cassette is transported to equipment, it is that the internal substrate was not located at the center of a cassette, but has stopped in one of the edges of a cassette in most cases. If the center of a cassette and the center of a substrate usually do not suit, the location is shifting and carrying out the internal substrate in many cases and a substrate is conveyed in ejection and the processing room of a process unit from a cassette as it is with a robot It may not be well set to the processing room inside equipment by location gap of a substrate, and when extreme, it may also happen that a substrate contacts equipment and is damaged.

[0007] Then, the location amendment device shown in drawing 10 as a means for correcting this location gap is established. It is a device for facing a substrate of 3 with a pusher, and, as for 2, 23 facing across the right-and-left ends of a substrate 3 by the cassette, in drawing 10 , and carrying out alignment of the longitudinal direction of a substrate, for example, the pusher on either side was connected with the rack and pinion, while is connected with a driving source like a cylinder. The window part required in order, as for the right-and-left ends of a cassette, to pinch this pusher's substrate is prepared. If a cylinder works now, a pusher on either side moves to a substrate side uniformly, and pushes the substrate. If the

only larger gap than the longitudinal-direction width-of-face size of a substrate when a pusher stops is taken, it will mean that the location of the longitudinal direction of all the substrates in a cassette was amended.

[0008] [Conventional example 2] drawing 11 is the external view showing the example of another conventional technology, it detects the center position of a substrate and the gap of a hand of cut which were produced inside the cassette by the sensor, shifts from the detection value of a sensor, calculates an amount, drives the table which put the substrate according to the result of an operation, and amends gap.

[0009] In drawing 11 , a robot and 2 show a cassette, 3 shows a substrate, and after 1 conveys a substrate 3 to a pointing device 14 and positions it by the robot 1 here, it conveys it in the processing room 12. A pointing device 14 has the sensor which detects each edge of right and left of a substrate 2, and a cross direction while being equipped with the driving source which moves the turntable which adsorbs a substrate 2 and is revolved, and a turntable to right and left and a cross direction. Three components delta X and delta Y of gap from the criteria location of a substrate and angle-of-rotation deltatheta are computed by these sensors, angle-of-rotation deltatheta is first corrected on a turntable, and delta X and delta Y are amended in a turntable driving source after that. (For example, JP,7-33232,A)

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] In this invention, in case a substrate is conveyed in the processing room in a liquid crystal manufacture process unit, it is full automatic in gap of the substrate produced inside the cassette, and it can amend without completely requiring time amount for location detection. Therefore, while being able to press down generating of the chipping which causes a crack of a ******** substrate on a problem conventionally, and dust to the minimum, it becomes unnecessary [the alignment by the help] and an effect remarkable in the improvement in efficiency of production of a liquid crystal substrate, the improvement in the yield, and improvement in reliability is acquired.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Since it was only location amendment of a longitudinal direction when based on the equipment of drawing 9 and drawing 10 , when transporting a cassette to a liquid crystal manufacture process unit for location amendment of a cross direction, after arranging the location of the end face of a substrate when an operator once leans a cassette by human power in order to arrange a cross direction, it had to install in the cassette base of equipment. Moreover, by this method, in order for the force to join the ends of a glass substrate mechanically, a chip (chipping) occurs on the edge of a substrate and it becomes the cause of the crack of a substrate, and whenever a chipping piles up a process, it not only worsens the yield, but it grows. For this reason, if a crack occurs in a final process, all the processes till then will become useless and will become huge [loss]. Moreover, dust will be generated for a contact process and this dust will make a fatal defective. Furthermore, since the weight of a cassette was a help and it forced to actuation of alignment further the thing hard [just to be and to carry no less than about tenkg], it included danger, such as a failure and an actuation failure.
[0011] Moreover, in the thing of the method of drawing 11 , although the trouble of the method of above-mentioned drawing 9 and drawing 10 was solvable, in order to amend location gap, considerable long time amount was needed and there was a problem that conveyance effectiveness fell.

[Translation done.]

MEANS

[Means for Solving the Problem] In a location compensator in a processor of a substrate for liquid crystal which has stationed a robot for carrying in and taking out a substrate to a cassette by which this invention can contain two or more substrates for liquid crystal While forming the direction regulation means of a transverse plane for once pushing in a substrate from a transverse-plane side of a cassette at the time of taking out of a substrate, and arranging the direction of a transverse-plane side of a substrate in the predetermined direction in a robot's hand section A side edge position transducer for detecting a side edge location of a substrate in a position in the condition that a robot took out a substrate from a cassette, It is the location compensator of a substrate for liquid crystal possessing an operation means to calculate the amount of bias from a criteria location of a side edge location of a substrate by considering an output of a side edge position transducer as an input, and to obtain location amendment data, and robot control equipment which amends future conveyance location data with location amendment data of this operation means.
[0013]
[A mode of implementation of invention] Drawing 1 is the perspective diagram showing an example of equipment of this invention. In this drawing, 1 is a substrate with which a robot for substrate conveyance and 2 are contained by cassette, and several many 3 is contained by cassette 2. A main part 12 is laid on a robot's 1 base 11, and it has the hand section 15 for adsorbing an arm 14 and a substrate 2 which were attached in the horizontally pivotable fixed pivot [go up and down / it / to a Z direction of drawing] 13, and a fixed pivot 13, and conveying them on a main part 12. An arm 14 is mutually connected pivotable like a graphic display, cooperates with a fixed pivot 13 and moves XY flat-surface (level surface) top of drawing for a hand 15. Moreover, gage pins 16a and 16b are formed in a hand 15, when it inserts into a cassette 2, a transverse-plane edge of a substrate 3 is pushed in, and it regulates so that a transverse-plane edge of a substrate 3 may become in parallel to the direction of Y. When a substrate 3 is pulled out from a cassette 3 by hand 15 to a robot's 1 fixed pivot 13, the side edge position transducer 17 is attached in a location at which a side edge of a substrate 3 arrives, and when a substrate is pulled out by this side edge position transducer 17, the sensor 18 which detects bias from a criteria location in which that side edge should be located is formed.
[0014] In equipment of this drawing, actuation when picking out a substrate 3 from a cassette 2 is explained with a flow chart of drawing 2 . A robot's 1 fixed pivot 13 is first moved to a Z direction, and a hand 15 is doubled with height which takes out a target substrate. Next, a hand 15 is inserted in the bottom of a substrate of an aim in a cassette 2, with this height maintained. At this time, if a hand 15 is inserted to a predetermined location into a cassette 2, a substrate will be regulated between gage pins 16a and 16b and back end sides of a cassette 2 which were established in a hand 15, and the direction of the front end of a substrate 3 (end face by the side of a transverse plane) will be arranged in the direction of Y of drawing in parallel. According to an adsorption device which is not illustrated after raising a hand 15 for a while in this condition and dipping up a substrate 3, adsorption immobilization of the substrate is carried out and it pulls out to the exterior of a cassette 2. When the direction of a cash drawer is made into the direction of X of drawing which met in the direction of an outlet of a cassette 2 and is pulled out thoroughly, it is made for a side edge of a substrate to serve as a location which stands face to face against the side edge position transducer 17 at this time. Where a hand 15 is pulled out thoroughly, a side edge location of a substrate is judged according to an output state of the sensor 18 of the side edge position transducer 17, and it is amount of amendments deltan of the direction of Y. It determines and

conveyance data to a process unit 4 is amended.
[0015] Drawing 3 is drawing showing a condition when pulling out thoroughly the hand 15 which adsorbed a substrate 3 from a cassette 2, this drawing (a) is a plan and this drawing (b) is a side elevation. In this drawing, each sign has given a same sign to a thing of drawing 1 and this function.
[0016] Moreover, drawing 4 is the plan showing an example of the side edge position transducer 17 of equipment shown in drawing 1 and drawing 3 . In the case of this drawing, it is a sensor a1 to the criteria location C in which it should be located when a side edge of a substrate 3 is normal. Or an And sensor b1 Or bn It is attached in bilateral symmetry, respectively. It is a sensor a1 here. b1 It is amount of allowance bias deltaYo to the criteria location C. It separates and is a sensor a2. Or an And b2 Or bn It is a gap deltaY1, respectively. Or deltaYn-1 It is attached in a distant location like a graphic display. Each sensor outputs ON, 1 [i.e.,], or a high-level signal, when a substrate exists in each upper part, and when a substrate does not exist, it uses what outputs a binary-logic signal used as OFF, 0 [i.e.,], or a low-level signal (or signal of relation of these reverse).
[0017] It sets to a side edge position transducer with which a sensor was formed like drawing 4 , and is the distance Ym from the criteria location C to the m-th sensor. Ym =deltaYo+deltaY1+ -- It can express with +deltaYm-1. When a robot's 1 hand 15 adsorbs a substrate 3 and reaches from a cassette 2 to a location of a cash drawer and drawing 3 in drawing 1 now, it is the m-th sensor bm of drawing 4 . Supposing all left-hand side sensors are detecting a substrate For the side edge location Y of a substrate 3, are in a method of the right [location / C / criteria] in the range of Ym-1 <=Y<=Ym, namely, a side edge of a substrate is sensor bm-1. Sensor bm It can distinguish that it is in between. It carries out also here and is Sensor bm. When a side edge of a substrate is in the latest location, it is tolerance a1, i.e., a sensor, about this. b1 Amount of location amendments deltam for making it move in between is Ym+deltaYo >=deltam >=Ym-deltaYo.... It must be (1).
[0018] Moreover, sensor bm-1 When a side edge location of a substrate is located in the latest location, it is amount of location amendments deltam. Ym-1+deltaYo >=deltam >=Ym-1-deltaYo .... It must be (2). So, sensor bm Sensor bm-1 Amount of location amendments deltam for moving this to tolerance, when a side edge location of a substrate is in between (1) A formula and (2) Ym-1+deltaYo >=deltam >=Ym-deltaYo in which both formulas are materialized .... What is necessary will be just to determine in (3).
[0019] Furthermore, it is (3). In order to materialize a formula, it is required to materialize Ym-1+deltaYo >=Ym-deltaYo. It is 2 and deltaYo >=Ym-Ym-1 from this.... It is set to (4) and is the above (3). A formula and (4) It is allowable-error deltaYo about amount of location amendments deltam, and a mounting pitch of a sensor to a suitable value with which are satisfied of a formula. What is necessary is to receive and just to set.
[0020] here -- temporary -- sensor a1 Or an And b1 Or bn supposing it installs by regular-intervals deltaY -- (3) a formula -- {deltaYo+(m-2) -deltaY}+deltaYo >=deltam -- and -- deltam >={deltaYo+(m-1) -deltaY}-deltaYo -- that is 2, deltaYo+ (m-2), delta Y>=delta m >= (m-1), and deltaY .... (5) [0021] Moreover, (4) A formula is 2 and deltaYo >=deltaY. .... It can simplify with (6).
[0022] Next, when a difference of an inside width-of-face size of a cassette 2 and width of face of a substrate 3 is set to L, when there is location gap of a substrate in the crosswise center about a criteria location then, it will be settled in each right and left less than a maximum of L / 2. now and drawing 5 -- like -- this amount of the maximum gaps -- right and left from the criteria location C -- every -- L / 2=Ymax ** -- carrying out -- during this period -- respectively -- n sensors (however, natural number of n>=1) -- preparing -- a sensor of the n-th piece to the amount Ymax of the maximum gaps distance to a location -- deltaYmax **, if it carries out Ymax =Yn+deltaYmax =(deltaYo+deltaY1+ -- +deltaYn-1) +deltaYmax It becomes.
[0023] The here above-mentioned (4) Considering formation conditions in case a side edge location of a substrate is located like the time of ******** in a formula on the outside of a sensor of the n-th piece, they are 2 and deltaYo >=Ymax-Yn as m=n. .... (7) to 2, and deltaYo >=deltaYmax .... (8) and formula (4) is materialized -- as -- mounting pitch deltaY of a sensor, and deltaYmax a value -- setting -- these -- responding -- amount of location amendments deltan (3) What is necessary will be just to set according to a formula.
[0024] Furthermore, it is a sensor a1. And b1 When henceforth is installed by regular-intervals deltaY, respectively, it is Ymax =deltaYo+(n-1) delta Y+delta Ymax.... It is set to (9). (9) deltaY of a formula, and deltaYmax (6) types -- and -- if (8) types are applied -- Ymax <=deltaYo+ (n-1), 2, deltaYo+2, and

deltaYo since it becomes -- n>=(Ymax-deltaYo)/(2 and deltaYo) .... It is set to (10).
[0025] so -- a time of installing a sensor by regular-intervals deltaY -- (6) A formula thru/or (8) and (10) types are satisfied -- as -- the number n of each sensor on either side, mounting pitch deltaY, and deltaYmax setting -- this -- responding -- amount of location amendments deltam (5) What is necessary will be just to set according to a formula.
[0026] If the number of sensors is made to increase so that the above-mentioned explanation may show, it will be allowable-error deltaYo. Although precision of location amendment can be raised since it can set up small A position error can be set to less than 1mm when the maximum amount of location gaps forms [actually] two sensors at a time in right and left from a criteria location to a criteria location at bilateral symmetry also in a certain time 4mm (a difference of an inside width-of-face size of a cassette and width of face of a substrate is 8mm), respectively.
[0027] That is, it is (6) when allowable-error deltaYo =1mm and Ymax =4mm. deltaY<=2 and deltaYo of a formula Mounting pitch deltaY of a sensor should just be deltaY<=2mm.
[0028] Moreover, distance deltaYmax to a location to which a side edge location of a substrate may come from a sensor of the maximum outside (8) It is set to 2x1 >=deltaYmax from a formula.
[0029] Moreover, when it sets with Ymax =4 and deltaYo =1 in (10) types, it is set to n>= (4-1)/2 and 1, and it turns out [n>=1.5, then] that it is good.
[0030] So, it is each sensor, when adopting n= 2 and installing every two sensors each in bilateral symmetry centering on the criteria location C (a). deltaYo =1mm, deltaY=2mm, deltaYmax =1mm, or (b) What is necessary is just to set up like deltaYo =1mm, deltaY=1.5mm, and deltaYmax =1.5mm.
[0031] Drawing 6 is the plan showing an example of the side edge position transducer 17 when performing it above, and is a1 and a2 to bilateral symmetry centering on the criteria location C. And b1 and b2 Two sensors each are formed. In addition, it sets to this drawing and is amax. And bmax A side edge location, i.e., Ymax, when the maximum gap ****** of the substrate is carried out A location is shown.
[0032] Next, the above (a) and amount of amendments deltam in each **** of (b) A decision method is explained.
[0033] In (a), it is (i). Sensor a1 And a2 A substrate is detected and it is a sensor b1. And b2 While not detecting, a side edge location of a substrate is a sensor a1. b1 It is in between, and since it is in an allowable error, it is referred to as amount deltam =deltaof amendments1 =0.
(ii) Sensor a2 It is accepted, and a substrate is detected or it is a sensor a1 and a2. And b1 It is detecting and is a sensor b2. While not detecting, a side edge location of a substrate is a sensor a1. a2 Between or sensor b1 b2 It is in either of between. (3) Since it is m= 2, deltaYo =1, Ym-1 =deltaYo =1, and Ym =deltaYo+deltaY=1+2=3 in a formula, it is the amount delta 2 of amendments. (3) These are substituted for a formula, it is set to 1+1 >=delta2 >=3-1, and it turns out [amount deltaof amendments2 =2mm then] that it is good. moreover, the amendment direction -- sensor a1 a time of detecting a substrate -- Y2 of drawing a direction -- a sensor a1 and a2 And b1 a time of detecting a substrate -- Y1 of drawing a direction -- then, it is good. [moreover,]
(iii) A sensor a1, a2, b1, and b2 While all are detecting whether all are detecting a substrate, a side edge location of a substrate is a sensor a2. Or b2 It is outside. Therefore, (3) Since it is m= 3, deltaYo =1, Ym-1 =3, and Ym =Ymax =4 in a formula, they are these (3) When it substitutes for a formula, it is set to 3+1 >=delta3 >=4-1, and is the amount delta 3 of amendments. It turns out that what is necessary is just to set to a suitable value in 3-4mm. Moreover, the amendment direction is Y1 of drawing, while all sensors are detecting a substrate. While all sensors are not detecting a substrate to a direction again, it is Y2 of drawing. What is necessary is just to consider as a direction.
[0034] In (b), it is (i). Sensor a1 And a2 A substrate is detected and it is a sensor b1 and b2. While not detecting, a side edge location of a substrate is a sensor a1. b1 It is in between, and since it is in an allowable error, it is referred to as amount deltam =deltaof amendments1 =0.
(ii) Sensor a2 It is accepted, and a substrate is detected or it is a sensor a1 and a2. And b1 It is detecting and is a sensor b2. While not detecting, a side edge location of a substrate is a sensor a1. a2 Between or sensor b1 b2 It is in either of between. (3) Since it is m= 2, deltaYo =1, Ym-1 =deltaYo =1, and Ym =deltaYo+deltaY=1+1.5=2.5 in a formula, it is the amount delta 2 of amendments. (3) It turns out that what is necessary is to substitute these for a formula, to be set to 1+1 >=delta2 >=2.5-1, and just to set to a suitable value in 2 >=delta2 >=1.5. Moreover, what is necessary is just to define the amendment direction according to an output state of each sensor like the time of the above (a).

(iii) A sensor a1, a2, b1, and b2 While all are detecting whether all are detecting a substrate, a side edge location of a substrate is a sensor a2. Or b2 It is outside. (3) Since it is m= 3, deltaYo =1, Ym-1 =3, and Ym =Ymax =4 in a formula, they are these (3) If it substitutes for a formula, it will be set to 2.5+1 >=delta3 >=4-1, and it is the amount delta 3 of amendments. It turns out that what is necessary is just to set to a suitable value in 3-3.5mm. Moreover, what is necessary is just to define the amendment direction according to an output state of each sensor like the time of the above (a).

[0035] If the above is summarized, it will become like drawing 7 and drawing 8 .

[0036] So, define data of drawing 7 or drawing 8 beforehand, and it is made to memorize corresponding to a mounting condition of a sensor. When a substrate is pulled out by a robot's 1 hand 15, a side edge location can be judged according to the condition that each sensor of the side edge position transducer 15 detected a substrate in a cash-drawer location, and the amount of amendments of the direction of Y and the amendment direction can be promptly acquired by reading data memorized previously. If this amount of amendments is considered and it is made to move when conveying a substrate from this result to the following process unit, a substrate will be installed correctly.

[0037] Although an existence range like a side edge of a substrate was judged with a binary-logic signal of whether two or more sensors were installed in bilateral symmetry centering on a criteria location, and each sensor detected a substrate, you may make it detect quantitatively the amount of gaps from a criteria location of a side edge of not only a thing of such a method but a substrate as a side edge position transducer in the above-mentioned example. In this case, if a thing and a CCD sensor which are called a line sensor from which an output changes to a side edge position transducer to change of a substrate's existence location at a linear are used, since the amount of amendments can be directly obtained as a difference of these outputs and reference values, positioning of high degree of accuracy will still be attained.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the perspective diagram showing the example of the equipment of this invention.
[Drawing 2] It is a flow chart for explaining actuation of this invention.
[Drawing 3] It is drawing showing the condition when pulling out thoroughly the hand 15 which adsorbed the substrate 3 in the example of drawing 1 from a cassette 2.
[Drawing 4] It is the plan showing the example of the side edge position transducer of the substrate used for the equipment of this invention.
[Drawing 5] The amount of the maximum gaps of the side edge location of the substrate used for the equipment of this invention Ymax It is plane drawing showing physical relationship with a sensor.
[Drawing 6] It is the plan showing the example of arrangement of the concrete sensor in the side edge position transducer of the substrate used for the equipment of this invention.
[Drawing 7] the equipment of this invention -- it is drawing showing an example with the combination of the output state of each sensor at the time of side edge location detection of the substrate to kick, the amount of amendments, and the amendment direction.
[Drawing 8] the equipment of this invention -- it is drawing showing another example with the combination of the output state of each sensor at the time of side edge location detection of the substrate to kick, the amount of amendments, and the amendment direction.
[Drawing 9] It is the perspective diagram showing the example of conventional equipment.
[Drawing 10] It is drawing showing the example of the conventional pointing device used for the conventional equipment of drawing 9 .
[Drawing 11] It is the perspective diagram showing the example of another conventional equipment.
[Description of Notations]
1 Robot
2 Cassette
3 Liquid Crystal Substrate
4 Process Unit
5 Liquid Crystal Pointing Device
11 Base
12 Robot Main Part
13 Fixed Pivot
14 Arm
15 Hand
16a, 16b Gage pin
17 Substrate Side Edge Position Transducer
18 Sensor

[Translation done.]

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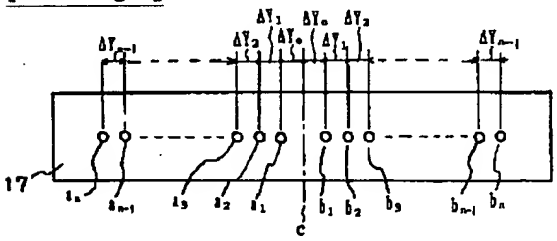
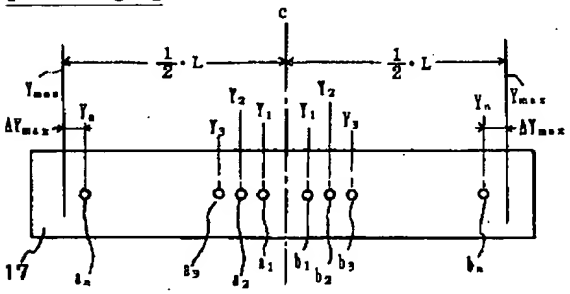
DRAWINGS

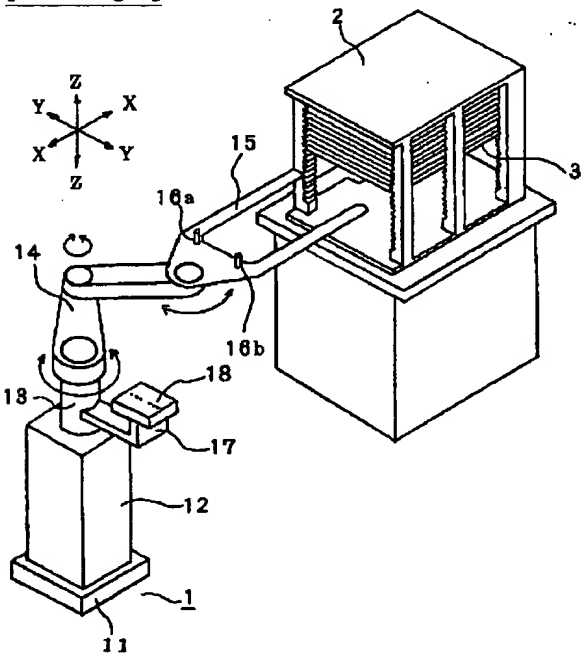
[Drawing 4]



[Drawing 5]

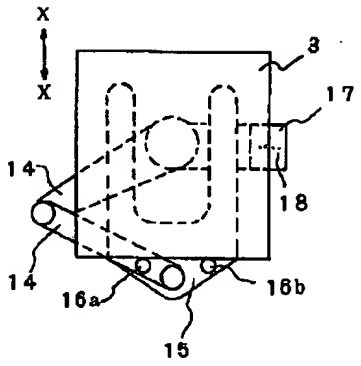


[Drawing 1]

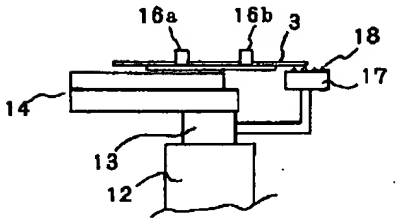


[Drawing 3]

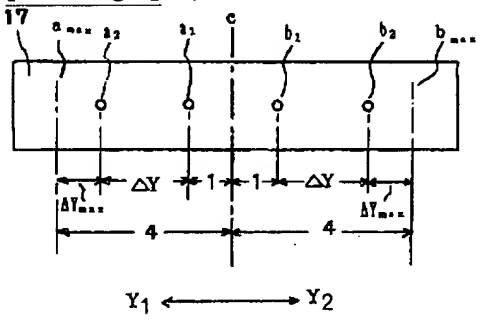
(a)



(b)



[Drawing 6]



[Drawing 7]

n=2、ΔY=2、 ΔYo=1

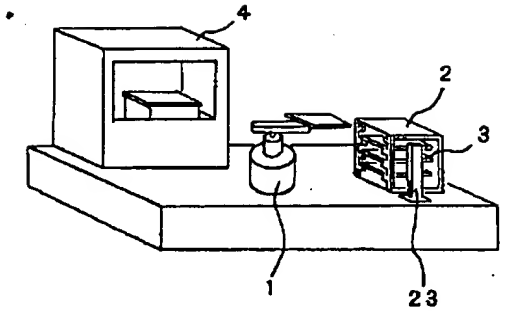
センサ出力				補正量	
a_2	a_1	b_1	b_2	δ_2 (mm)	方向
ON	ON	OFF	OFF	0	--
ON	OFF	OFF	OFF	2.0	Y_2
ON	ON	ON	OFF		Y_1
OFF	OFF	OFF	OFF	3.0 ～ 4.0	Y_2
ON	ON	ON	ON		Y_1

[Drawing 8]

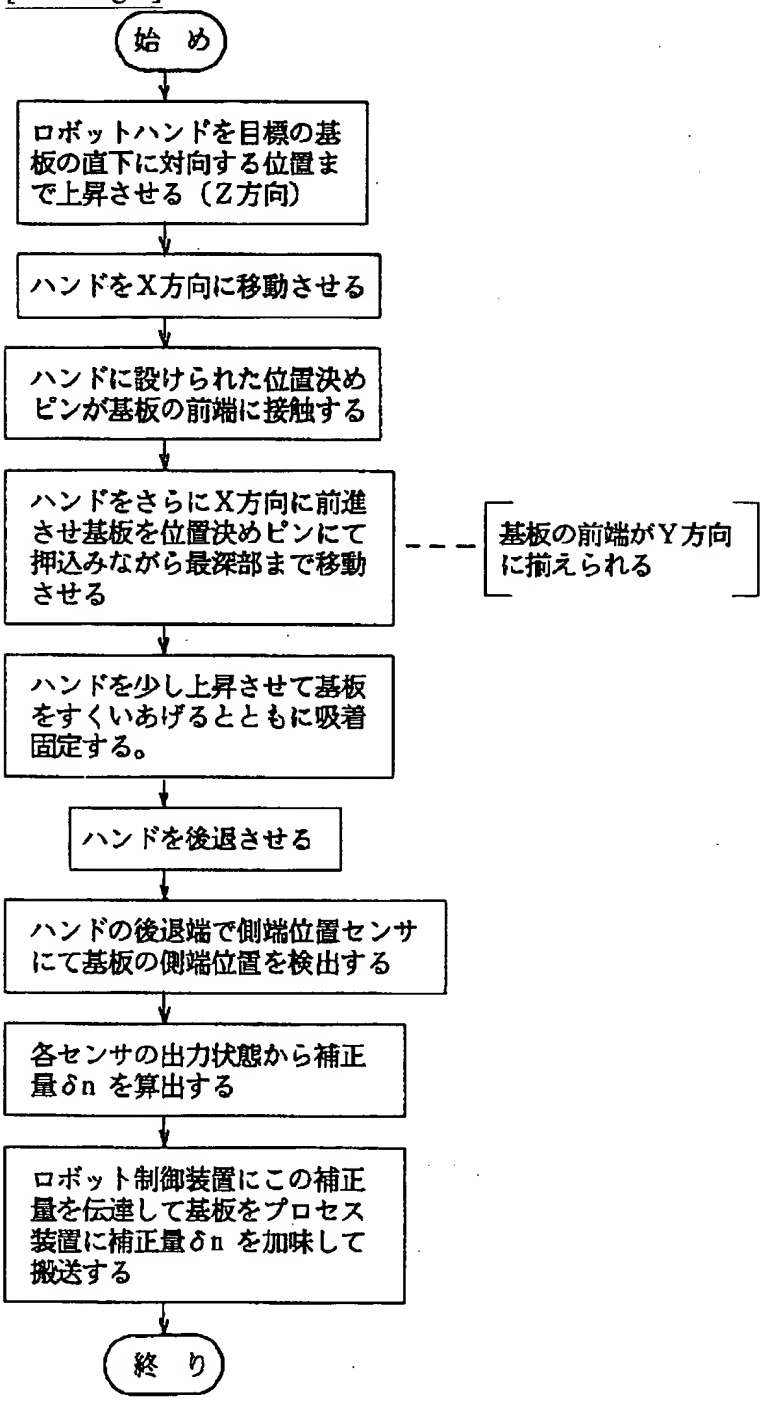
n=2、 ΔY=1.5、 ΔYo=1

センサ出力				補正量	
a_2	a_1	b_1	b_2	δ_2 (mm)	方向
ON	ON	OFF	OFF	0	--
ON	OFF	OFF	OFF	1.5 ～ 2.0	Y_2
ON	ON	ON	OFF		Y_1
OFF	OFF	OFF	OFF	3.0 ～ 3.5	Y_2
ON	ON	ON	ON		Y_1

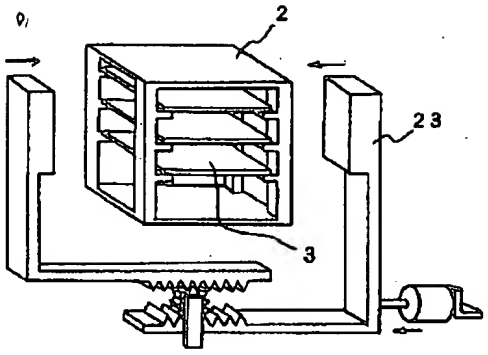
[Drawing 9]



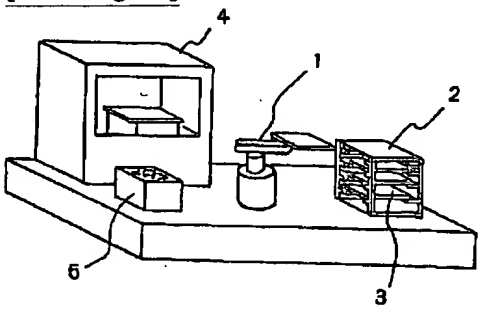
[Drawing 2]



[Drawing 10]



[Drawing 11]



[Translation done.]

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CLAIMS

[Claim(s)]
[Claim 1] A robot which holds and conveys a rectangle-like glass substrate, and detection equipment for detecting a location gap of said glass substrate, Y-axis migration which intersects perpendicularly with said X-axis migration X-axis migration for which it **** and said robot moves said glass substrate in the flexible direction of said robot's hand, and said glass substrate It is non-contact alignment equipment for glass substrates which was constituted so that it might carry out, and was constituted so that a location gap of a glass substrate contained by cassette by said robot might be corrected and it might convey at degree production process. It is arranged so that a position sensor for detecting a location gap of a glass substrate may detect the edge of two sides the edge and a glass substrate cross at right angles. One position sensor is arranged in one one side, the location is detected, two position sensors are arranged in one side of another side, and an inclination of a glass substrate is detected. Non-contact alignment equipment for glass substrates characterized by being constituted so that said two position sensors arranged in order to measure an inclination of said glass substrate may detect after holding a glass substrate by said hand.
[Claim 2] A robot which holds and conveys a rectangle-like glass substrate, and detection equipment for detecting a location gap of said glass substrate, Y-axis migration which intersects perpendicularly with said X-axis migration X-axis migration for which it **** and said robot moves said glass substrate in the flexible direction of said robot's hand, and said glass substrate It is non-contact alignment equipment for glass substrates which was constituted so that it might carry out, and was constituted so that a location gap of a glass substrate contained by cassette by said robot might be corrected and it might convey at degree production process. A front edge detection sensor which detects one location of the front edge of said glass substrate in the case of X-axis migration of said hand, A side edge detection sensor which detects about [the side edge of said substrate] 2 location in the case of Y-axis migration of said glass substrate, It is ****(ed) and constituted and said hand is equipped with said front edge detection sensor. If this sensor reaches the front edge of said glass substrate, a location of the front edge of said glass substrate will be detected. Said side edge detection sensor is arranged near [side] said robot, and if the side edge of said glass substrate held at said hand reaches said side detection sensor, a location of the side edge of said glass substrate will be detected. Non-contact alignment equipment for glass substrates characterized by calculating by signal outputted from said front edge detection sensor and said side edge detection sensor, and correcting a location gap of said glass substrate.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] It is related with the non-contact alignment equipment of the glass substrate which this invention mainly performs alignment of a thin glass substrate, and is conveyed at degree production process.
[0002]
[Description of the Prior Art] In case the glass substrate contained by the cassette is generally taken out with a carrier robot and it conveys at degree production process, a glass substrate is horizontal, and inclines, or shifts to a cross direction, and is not necessarily arranged within the cassette in the location of normal. In order to process a glass substrate with processing equipment, it is necessary to perform the so-called alignment which will amend a location gap of a glass substrate by the time it is necessary to arrange in the location of the predetermined normal of processing equipment, therefore conveys at degree production process from a cassette. Conventional alignment equipment is proposed by JP,9-69548,A or JP,10-335420,A.
[0003] The former alignment equipment has a cassette, the aligner arranged near the side of glass substrate W contained by the cassette, and the robot which takes out and conveys a glass substrate, and is constituted. Two places are equipped with the 1st position sensor which detects the location of the flank edge of a glass substrate in an aligner, and one place is equipped with the 2nd position sensor which detects the location of the anterior part edge of a glass substrate to a robot at the hand section. Constituted so that approach, migration in the isolated direction, and migration in the vertical direction may be performed to a glass substrate, in order that the 1st position sensor with which an aligner is equipped may detect the location of all the glass substrates contained by the cassette, the 2nd position sensor with which a robot's hand section is equipped detects the location of the anterior part edge of a glass substrate by migration of a robot. If the inclination and Y shaft-orientations location of a glass substrate are detected by the 1st two position sensor, according to the inclination of a glass substrate, an angle setup of a robot's hand will be carried out by the control unit, and if the expanding location (location of X shaft orientations) of a hand is set up, a hand moves in the condition and the 2nd position sensor adsorbs in a glass substrate, a glass substrate will be conveyed by degree production process in the condition of having adsorbed by the hand in the location of normal.
[0004] The 2nd position sensor to which it is equipped with the 1st position sensor which detects the anterior part edge of a glass substrate by two places in the location where a robot's hand and the latter alignment equipment cross at right angles to the direction of the expanding direction of a hand, and it detects the flank edge of a glass substrate by one place near a robot's flank is arranged. A hand carries out X-axis migration, if the 1st two position sensor reaches the anterior part edge of a glass substrate, the inclination of a glass substrate and the location of X shaft orientations can be measured by sensing of the 1st position sensor, and an angle setup of the hand will be carried out by it according to the inclination of a glass substrate in a hand before glass substrate adsorption. Before being crooked, being moved to a robot main part side and the hand which carried out adsorption maintenance of the glass substrate conveying a glass substrate at degree production process, Y-axis migration is carried out and it brings the flank edge of a glass substrate close to the 2nd position sensor. And the 2nd sensor's sensing of the flank edge of a glass substrate measures the location of Y shaft orientations of a glass substrate. The location of the normal of a glass substrate calculates by the 1st position sensor and 2nd position sensor, a

hand is set as the location of normal, and a glass substrate is conveyed at degree production process.
[0005]
[Problem(s) to be Solved by the Invention] However, in the condition that a glass substrate is contained by the cassette, if a glass substrate is enlarged by increase of the need, the glass substrate is laid so that it may be caudad bent by the center section greatly to a transverse plane. Therefore, in this condition, in case the part of bending is returned in case adsorption maintenance of the glass substrate is carried out by the hand, and the inclination of a hand is corrected, an adsorption front and after adsorption, the gap with measured value will arise and a correction error will be produced.
[0006] In the case of the former alignment equipment, detection of the Y-axis location of a glass substrate is performed among conventional equipment by the 1st two position sensor with which the aligner was equipped. And before a robot's hand carries out adsorption maintenance of the glass substrate, in order that this aligner may detect the flank edge of a glass substrate, it will produce the correction error of the location of Y shaft orientations of the flank edge of a glass substrate the glass substrate adsorption front of a hand, and after adsorption. Since it is constituted so that vertical migration may be performed in order to detect the location of all the glass substrates with which this aligner was furthermore contained by the cassette, and it is constituted so that migration which moreover carries out approach isolation to all glass substrates may be performed, it has a complicated configuration and expensive equipment will be offered.
[0007] Moreover, since the latter alignment equipment is constituted so that the anterior part edge of a glass substrate may be measured by two position sensors, before adsorbing by the hand, the gap with measured value arises, and in case the inclination of a hand is corrected after hand adsorption, measurement of the inclination of the glass substrate by detection of two locations of the anterior part edge of a glass substrate will become a correction error, and will appear.
[0008] In case this invention does not solve an above-mentioned technical problem, and does not need expensive equipment but moreover carries out adsorption conveyance of the large-sized glass substrate, it aims at offering the non-contact alignment equipment of the glass substrate which can make the correction error of a glass substrate very small.
[0009]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, it constitutes from non-contact alignment equipment of a glass substrate in connection with this invention as follows. Namely, a robot which holds and conveys a rectangle-like glass substrate and detection equipment for detecting a location gap of said glass substrate, Y-axis migration which intersects perpendicularly with said X-axis migration X-axis migration for which it **** and said robot moves said glass substrate in the flexible direction of said robot's hand, and said glass substrate It is non-contact alignment equipment for glass substrates which was constituted so that it might carry out, and was constituted so that a location gap of a glass substrate contained by cassette by said robot might be corrected and it might convey at degree production process.

TECHNICAL FIELD

[The technical field to which invention belongs] It is related with the non-contact alignment equipment of the glass substrate which this invention mainly performs alignment of a thin glass substrate, and is conveyed at degree production process.

[Translation done.]

PRIOR ART

[Description of the Prior Art] In case the glass substrate contained by the cassette is generally taken out with a carrier robot and it conveys at degree production process, a glass substrate is horizontal, and inclines, or shifts to a cross direction, and is not necessarily arranged within the cassette in the location of normal. In order to process a glass substrate with processing equipment, it is necessary to perform the so-called alignment which will amend a location gap of a glass substrate by the time it is necessary to arrange in the location of the predetermined normal of processing equipment, therefore conveys at degree production process from a cassette. Conventional alignment equipment is proposed by JP,9-69548,A or JP,10-335420,A.

[0003] The former alignment equipment has a cassette, the aligner arranged near the side of glass substrate W contained by the cassette, and the robot which takes out and conveys a glass substrate, and is constituted. Two places are equipped with the 1st position sensor which detects the location of the flank edge of a glass substrate in an aligner, and one place is equipped with the 2nd position sensor which detects the location of the anterior part edge of a glass substrate to a robot at the hand section. Constituted so that approach, migration in the isolated direction, and migration in the vertical direction may be performed to a glass substrate, in order that the 1st position sensor with which an aligner is equipped may detect the location of all the glass substrates contained by the cassette, the 2nd position sensor with which a robot's hand section is equipped detects the location of the anterior part edge of a glass substrate by migration of a robot. If the inclination and Y shaft-orientations location of a glass substrate are detected by the 1st two position sensor, according to the inclination of a glass substrate, an angle setup of a robot's hand will be carried out by the control unit, and if the expanding location (location of X shaft orientations) of a hand is set up, a hand moves in the condition and the 2nd position sensor adsorbs in a glass substrate, a glass substrate will be conveyed by degree production process in the condition of having adsorbed by the hand in the location of normal.

[0004] The 2nd position sensor to which it is equipped with the 1st position sensor which detects the anterior part edge of a glass substrate by two places in the location where a robot's hand and the latter alignment equipment cross at right angles to the direction of the expanding direction of a hand, and it detects the flank edge of a glass substrate by one place near a robot's flank is arranged. A hand carries out X-axis migration, if the 1st two position sensor reaches the anterior part edge of a glass substrate, the inclination of a glass substrate and the location of X shaft orientations can be measured by sensing of the 1st position sensor, and an angle setup of the hand will be carried out by it according to the inclination of a glass substrate in a hand before glass substrate adsorption. Before being crooked, being moved to a robot main part side and the hand which carried out adsorption maintenance of the glass substrate conveying a glass substrate at degree production process, Y-axis migration is carried out and it brings the flank edge of a glass substrate close to the 2nd position sensor. And the 2nd sensor's sensing of the flank edge of a glass substrate measures the location of Y shaft orientations of a glass substrate. The location of the normal of a glass substrate calculates by the 1st position sensor and 2nd position sensor, a hand is set as the location of normal, and a glass substrate is conveyed at degree production process.

[0005]

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, the alignment equipment of this invention is constituted so that two position sensors which detect the inclination of a glass substrate may be detected after substrate adsorption. Therefore, even if the enlarged substrate has the big amount of bending and is contained within the cassette, if two locations are detected after adsorbing, in case the correction error of a substrate can be lessened extremely and it will be processed at degree production process, a substrate can be arranged with a sufficient precision.
[0031] Moreover, one position sensor which detects one location of the front edge of a substrate is prepared in a robot's hand, if two position sensors which detect two locations of the side edge of a substrate are prepared in at least one place of a robot's Y-axis migration direction, after substrate adsorption, the inclination of a substrate can be detected, and can be measured, and the correction error of the hand of the robot under the effect of bending of a substrate can be lessened extremely. Therefore, accurate processing can be performed in degree production process.

[Translation done.]

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[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, in the condition that a glass substrate is contained by the cassette, if a glass substrate is enlarged by increase of the need, the glass substrate is laid so that it may be caudad bent by the center section greatly to a transverse plane. Therefore, in this condition, in case the part of bending is returned in case adsorption maintenance of the glass substrate is carried out by the hand, and the inclination of a hand is corrected, an adsorption front and after adsorption, the gap with measured value will arise and a correction error will be produced.
[0006] In the case of the former alignment equipment, detection of the Y-axis location of a glass substrate is performed among conventional equipment by the 1st two position sensor with which the aligner was equipped. And before a robot's hand carries out adsorption maintenance of the glass substrate, in order that this aligner may detect the flank edge of a glass substrate, it will produce the correction error of the location of Y shaft orientations of the flank edge of a glass substrate the glass substrate adsorption front of a hand, and after adsorption. Since it is constituted so that vertical migration may be performed in order to detect the location of all the glass substrates with which this aligner was furthermore contained by the cassette, and it is constituted so that migration which moreover carries out approach isolation to all glass substrates may be performed, it has a complicated configuration and expensive equipment will be offered.
[0007] Moreover, since the latter alignment equipment is constituted so that the anterior part edge of a glass substrate may be measured by two position sensors, before adsorbing by the hand, the gap with measured value arises, and in case the inclination of a hand is corrected after hand adsorption, measurement of the inclination of the glass substrate by detection of two locations of the anterior part edge of a glass substrate will become a correction error, and will appear.
[0008] In case this invention does not solve an above-mentioned technical problem, and does not need expensive equipment but moreover carries out adsorption conveyance of the large-sized glass substrate, it aims at offering the non-contact alignment equipment of the glass substrate which can make the correction error of a glass substrate very small.

[Translation done.]

MEANS

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, it constitutes from non-contact alignment equipment of a glass substrate in connection with this invention as follows. Namely, a robot which holds and conveys a rectangle-like glass substrate and detection equipment for detecting a location gap of said glass substrate, Y-axis migration which intersects perpendicularly with said X-axis migration X-axis migration for which it **** and said robot moves said glass substrate in the flexible direction of said robot's hand, and said glass substrate It is non-contact alignment equipment for glass substrates which was constituted so that it might carry out, and was constituted so that a location gap of a glass substrate contained by cassette by said robot might be corrected and it might convey at degree production process. It is arranged so that a position sensor for detecting a location gap of a glass substrate may detect the edge of two sides the edge and a glass substrate cross at right angles. One position sensor is arranged in one one side, the location is detected, two position sensors are arranged in one side of another side, and an inclination of a glass substrate is detected. Said two position sensors arranged in order to measure an inclination of said glass substrate are characterized by being constituted so that it may detect after holding a glass substrate by said hand.
[0010] Moreover, non-contact alignment equipment for glass substrates in connection with this invention A robot which holds and conveys a rectangle-like glass substrate, and detection equipment for detecting a location gap of said glass substrate, Y-axis migration which intersects perpendicularly with said X-axis migration X-axis migration for which it **** and said robot moves said glass substrate in the flexible direction of said robot's hand, and said glass substrate Are constituted so that it may carry out, and it is constituted so that a location gap of a glass substrate contained by cassette by said robot may be corrected and it may convey at degree production process. A front edge detection sensor which detects one location of the front edge of said glass substrate in the case of X-axis migration of said hand, A side edge detection sensor which detects about [the side edge of said substrate] 2 location in the case of Y-axis migration of said glass substrate, It is ****(ed) and constituted and said hand is equipped with said front edge detection sensor. If this sensor reaches the front edge of said glass substrate, a location of the front edge of said glass substrate will be detected. Said side edge detection sensor is arranged near [side] said robot, and if the side edge of said glass substrate held at said hand reaches said side edge detection sensor, a location of the side edge of said glass substrate will be detected. It is characterized by calculating by signal outputted from said front edge detection sensor and said side edge detection sensor, and correcting a location gap of said glass substrate.
[0011]
[Embodiment of the Invention] Hereafter, the gestalt of 1 implementation of this invention is explained based on a drawing.
[0012] The non-contact alignment equipment M for glass substrates of this gestalt (henceforth alignment equipment) The cassette 2 which is arranged on a stand 1 and contains rectangle-like glass substrate (henceforth substrate) W as shown in drawing 1 -2, It has the aligners 5 and 5 which are installed in the location which counters the transverse plane of a cassette 2 by the movable robot 3 and the both sides of the rail object 4 through the rail object 4 in a stand 1 top in the longitudinal direction (Y shaft orientations) of a stand 1. Furthermore, by the example of drawing, on both sides of a robot 3, a cassette 2 and the side which counters are arranged as a customer stage, and the production process [degree] equipments 7, such as a cassette for customers or processing equipment, are arranged on the customer stage.

[0013] As shown in a cassette 2 at drawing 3 , in order to contain two or more substrates W in the vertical direction, the substrate supporter 21 which projects from both walls is arranged in two or more steps. A robot's 3 hand 31 inserts the substrate supporter 21 into a cassette 2, and it is formed so that vertical migration can be carried out and it may have the space section in the center section. And the large-sized substrate W is contained by this cassette 2, and Substrate W is laid on the substrate supporter 21 so that a center section may bend greatly caudad in the front view in which a hand 31 is inserted.
[0014] A robot 3 has the hand 31 connected with **** 32 and **** 32 rotatable to the rotatable arm object 33 and the arm object 33, and he is constituted so that the substrate W by which adsorption maintenance was carried out on the hand 31 may be moved linearly. Furthermore, it is attached in the hand 31 so that the front edge detection sensor 35 which detects the location (X1) of the front edge of the substrate W contained in the cassette 2 may lay underground. If the front edge of the substrate W with which the reflective-type photosensor was used and the front edge detection sensor 35 was contained by the cassette 2 with the hand 31 is passed in the lower part of Substrate W, the front edge detection sensor 35 By sensing the light in which the light on which it is projected toward the upper part from the front edge detection sensor 35 was shaded and reflected by Substrate W, the location X1 of the front edge of the substrate W from the former location of a hand 31 is detected. The location (X1) of the front edge of the detected substrate W is outputted to the control unit 9 arranged on a stand 1.
[0015] Moreover, a robot 3 operates so that X-axis migration which moves a hand 31 in the flexible direction toward a cassette 2 or production process [degree] equipment 7, Y-axis migration which robot 3 the very thing moves to the longitudinal direction of a stand 1, Z-axis migration which carries out vertical migration of the arm object 33 and the hand 31 to **** 32, and theta rotation which rotates a hand 31 to **** 32 with the arm object 33 further may be performed.
[0016] Aligners 5 and 5 are arranged on both sides of a robot 3 at the both sides of the rail object 4 in accordance with a robot's 3 Y shaft orientations, respectively, and he is trying to detect the side edge of Substrate W by one of the aligners 5 depending on the arrangement condition of a cassette 2 or production process [degree] equipment 7. Two side edge detection sensors 52 and 52 which detect two locations (Y1, Y2) of the side edge of Substrate W to the side of Substrate W and abbreviation parallel are attached in the sensor susceptor 51 at each aligner 5, respectively. As for the side edge detection sensor 52, a reflective-type photosensor or the photosensor of floodlighting / light-receiving mold is used. If the hand 31 which carried out adsorption maintenance moves Substrate W to return and a robot's 3 Y shaft orientations from the inside of a cassette 2 at the dimension 1 on a robot's 3 **** 31 and the side edge of Substrate W passes through the upper part of the side edge detection sensor 52 It senses by reflecting the light on which it was projected in the case of a proximity sensor, and by shading with a substrate the light on which it is projected from the projector, in the case of floodlighting / light-receiving mold, an electric eye senses protection from light, and detects two locations (Y1, Y2) of the cross direction of the side edge of Substrate W to it. Two locations (Y1, Y2) of the side edge of the detected substrate W are outputted to the above-mentioned control unit 9.
[0017] A robot's 3 hand 31 therefore, by detecting one location (X1) of the front edge of Substrate W By correcting the location of X shaft orientations of Substrate W, carrying out adsorption maintenance of the substrate W, and detecting two locations (Y1, Y2) of the side edge of Substrate W, the location and inclination of Y shaft orientations are corrected, and Substrate W is moved to degree production process toward Y shaft orientations.
[0018] Next, an operation of the alignment equipment M constituted as mentioned above is explained. If a cassette 2 is carried in from the outside and installed in a position as shown in drawing 1 after Substrate W has contained in a cassette 2, a robot's 3 hand 31 will check the existence of the substrate W on the substrate supporter 21 of each stage by the substrate existence sensor which carries out Z-axis migration and which is not illustrated. After a substrate existence sensor detects the existence of Substrate W, as shown in drawing 4 -5, in order that a robot's 3 hand 31 may carry out adsorption maintenance of the substrate W of for example, the maximum upper case, X-axis migration is performed.
[0019] The location (front edge detection sensor 35) before this hand 31 carries out X-axis migration is made into a home position P1, after that, glass substrate W of a cassette 2 goes caudad, and a hand 31 moves forward. In this production process, a hand 31 moves at high speed from the home position P1 to the location P2 in front of glass substrate W (refer to drawing 5), and moves by slow speed to the location P3 carried out for a while across the front end edge of glass substrate W from the location of

P2. During this slow speed migration, when the front edge of glass substrate W shades the light floodlighted from the front edge detection sensor 35, light is reflected, and the location (distance from P1 to X1) of the front edge of glass substrate W can be measured. And a hand 31 moves from the location of a hand 31P3 to the location P4 which adsorbs glass substrate W at high speed. Therefore, while being moved even to the predetermined lower part location of glass substrate W from a home position P1, a hand 31 will move by slow speed, when measuring the location of glass substrate W, and will move at high speed except it. And the location of measured glass substrate W is [0020] memorized within a control unit 9 as it is. Next, a hand 31 adsorbs glass substrate W with the adsorber which will not be illustrated if it goes up slowly in the location of P4 and the inferior surface of tongue of glass substrate W is contacted as shown in the front view of drawing 6 , and carries out a small rise further (adsorption process). Bending is absorbed and the substrate W which has bent caudad is held on an abbreviation plane at the same time it is adsorbed by the hand 31.

[0021] Then, as shown in drawing 7 , back space migration is carried out from the location of a hand 31P4 to a home position P1 by high-speed motion. And the hand 31 which returned to the home position P1 moves by the motion [slow speed / to a location P5] which passed the side edge detection sensor 52 by which the right side edge side edge of Substrate W was equipped rightward with the rail object 4 top by the right-hand side aligner 5 among drawing among drawing, and was carried out for a while with the robot 3. During this slow speed migration, in case two locations (Y1, Y2) of the right side edge side edge of Substrate W pass through the side edge detection sensor 52 top, it will reflect, when Substrate W shades the light to the upper part [sensor / 52 / side edge detection] on which it was projected, and two locations (Y1, Y2) of a substrate W side edge edge will be measured. Two locations (Y1, Y2) of the side edge edge of the measured substrate W are memorized within a control unit 9 as they are. In addition, when the hand 31 which carried out adsorption maintenance of the substrate W returns to a home position P1, you may make it the side edge detection sensor 52 of the left-hand side aligner 5 detect the left-hand side side edge of Substrate W among drawing.

[0022] In order to contain Substrate W to production process [degree] equipment 7, the hand 31 which moved to the location of P5 moves in the rail object 4 top arranged on a stand 1 the robot 3 whole main part, moves to the location P6 (refer to drawing 9) which counters production process [degree] equipment 7, and does 180 degreetheta rotation of a hand 31. In case [this] it moves, as shown in drawing 8 , a robot 3 calculates from amount of location gaps deltaY to X shaft orientations between the 2 locations (Y1, Y2) of the side edge of the substrate W calculated with the control unit 9, and amends a hand 31 by amount of angle gaps **theta. This amount of angle gaps deltatheta can ask for tan**theta =**Y/Z to **theta, if distance between two side edge detection sensors 52 and 52 is set to Z. Angle correction of a hand 31 is performed by rotating angle-of-inclination theta to **** 9. Moreover, the halt location of a Y-axis where production process [degree] equipment 7 receives is amended by the amount of location gaps with the location of normal to the location of either Y1 of the side edge of the substrate W detected by the side edge detection sensors 52 and 52, or Y2, and is determined.

[0023] Then, as shown in drawing 9 , a hand 31 carries out advance migration toward production process [degree] equipment 7 at high speed, where Substrate W is adsorbed, it descends by slow speed migration, and contains glass substrate W to production process [degree] equipment. The X-axis movement magnitude of a substrate amends a part for amount of location gaps deltaX of the location X1 of the front edge of Substrate W and the location of normal which were detected by the front edge detection sensor 35, and is decided.

[0024] In this way, by the hand 31, sequential adsorption is carried out from a top, and all the substrates W contained by the cassette 2 in two or more steps have a location corrected, and are conveyed and contained by production process [degree] equipment 7.

[0025] Therefore, with the alignment equipment M of this gestalt, in case the current position of Substrate W is detected, after adsorbing Substrate W to one side with little effect of the correction error by bending of Substrate W (side edge) by the hand 31 Two detection sensors 52 and 52 detect, the inclination of Substrate W is measured, and before adsorbing Substrate W by the hand 31, other one side with little effect by bending of Substrate W (front edge) is constituted so that it may measure by one detection sensor 35. That is, by constituting so that the side edge detection sensors 52 and 52 of Substrate W may be arranged on both sides of a stand 1 on both sides of a robot 3 to the direction of Y-axis migration of a robot 3, since it measures after taking out the inclination of Substrate W from a cassette 2, a correction error can be lessened.

[0026] In addition, above-mentioned alignment equipment is not restricted to the above-mentioned gestalt. For example, as long as it constitutes the position sensor which measures one side of Substrate W by two places so that it may carry out after substrate adsorption in order to measure the inclination of Substrate W, the aligner 5 equipped with two position sensors may be arranged in the location which carries out proximal to a cassette 2 in the location which does not interfere in a cassette 2, for example. And two position sensors will detect the front edge of Substrate W in this case.

[0027] Moreover, even if it is not the location which counters a cassette 2 on both sides of a robot 3, production process [degree] equipment 7 may be arranged so that it may install in a cassette 2 side side by side. Moreover, amendment timing of location gap deltaX of the front edge of Substrate W may be performed, before a robot's 3 hand 31 adsorbs a substrate 31 after detecting the front edge, in case a hand 31 adsorbs Substrate W and returns to a home position P1, it may be performed, and it may be performed in the case of Y-axis migration of a robot 3.

[0028] Furthermore, anywhere not only in the location shown in drawing but the hand 31 is sufficient as the location of the front edge detection sensor 35 with which a robot's 3 hand 31 is equipped, for example, it may be the point of a hand 31.

[0029] Moreover, as long as it does not interfere in a substrate, the location of the Z direction of the side edge detection sensors 52 and 52 with which an aligner 5 is equipped may be arranged so that light may be turned and projected downward from a top.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The outline plan of the alignment equipment by one gestalt of this invention
[Drawing 2] A view drawing in drawing 1
[Drawing 3] the part which shows the condition that a substrate has bending and is contained by the cassette -- a transverse-plane cross section
[Drawing 4] The outline plan showing the condition that a hand moves into a cassette
[Drawing 5] the part which shows the condition that a hand moves into a cassette -- a side cross section
[Drawing 6] the part which shows the condition that a hand adsorbs a substrate and goes up -- front view

[Drawing 7] The outline plan showing the condition of detecting the location of the side edge of a substrate
[Drawing 8] Explanatory drawing for calculating a location gap of a substrate
[Drawing 9] The outline plan showing the condition that a hand contains a substrate to production process [degree] equipment
[Description of Notations]
M -- Alignment equipment
1 -- Stand
2 -- Cassette
3 -- Robot
5 -- Aligner
7 -- Production process [degree] equipment
9 -- Control unit
31 -- Hand
35 -- Front edge detection sensor
52 -- Side edge detection sensor
W -- Substrate

[Translation done.]

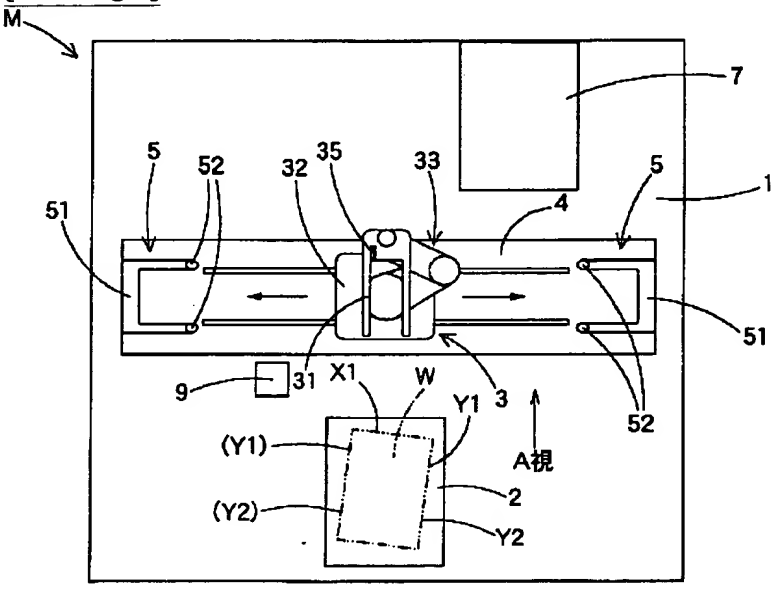
* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

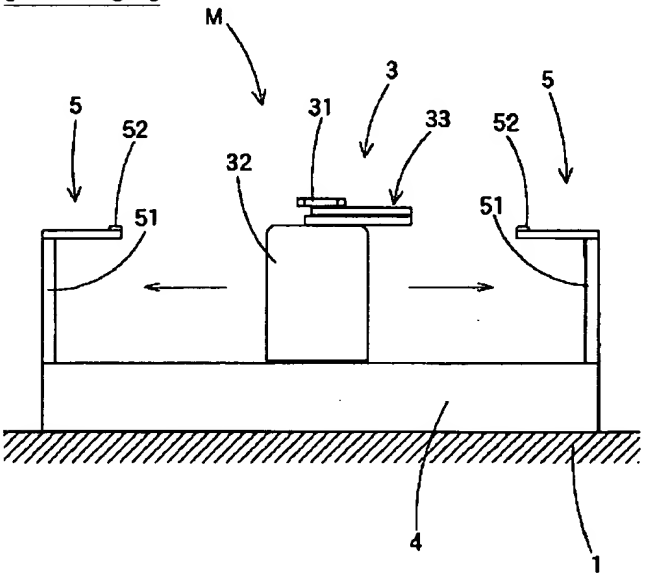
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

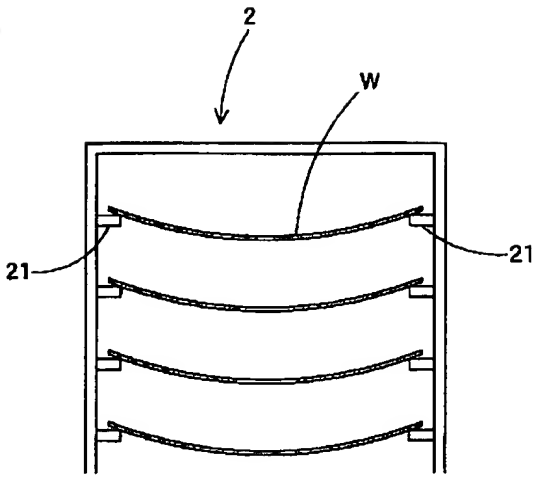
[Drawing 1]



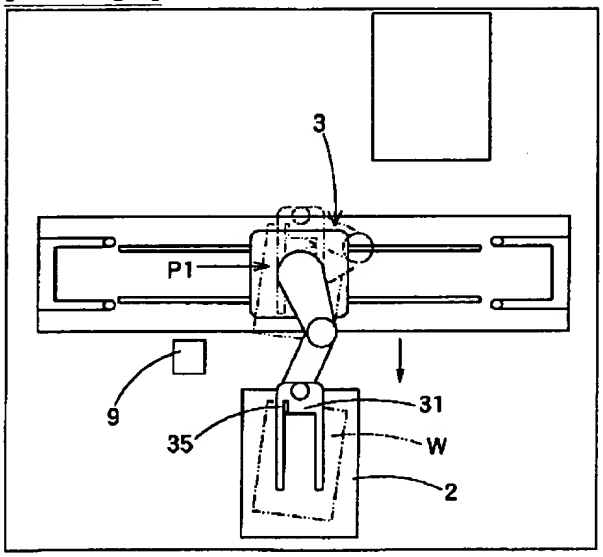
[Drawing 2]



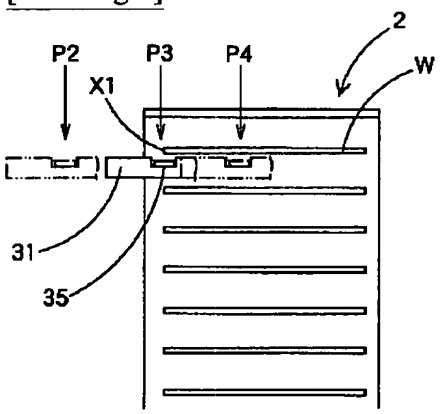
[Drawing 3]



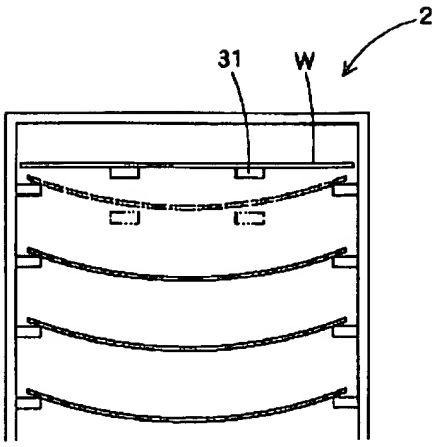
[Drawing 4]



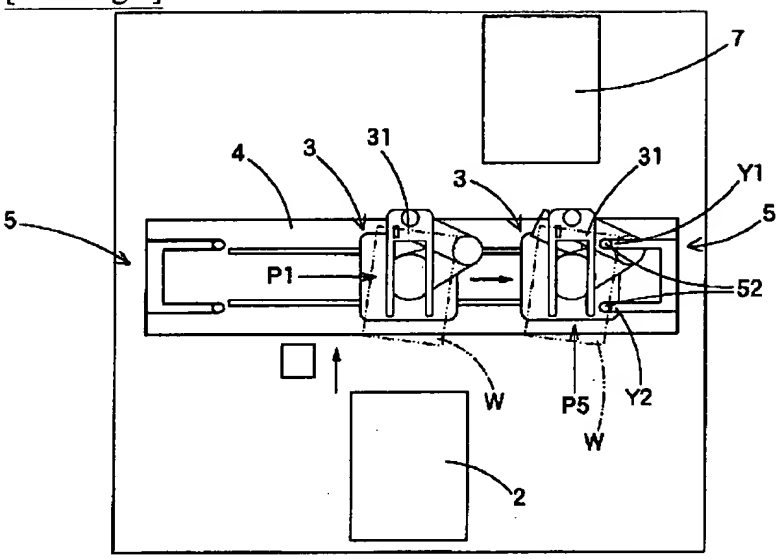
[Drawing 5]



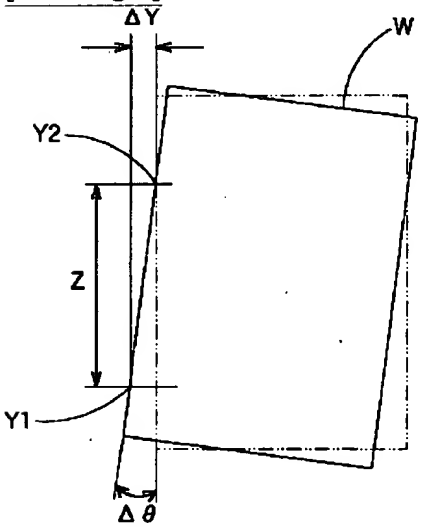
[Drawing 6]



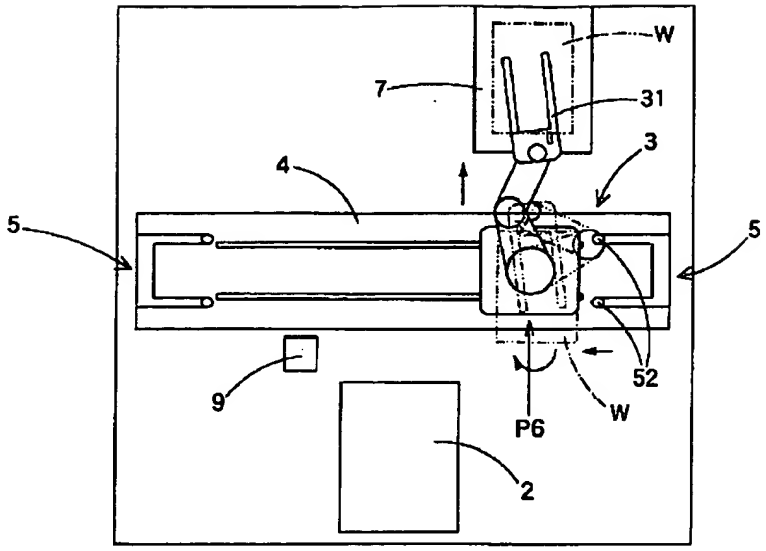
[Drawing 7]



[Drawing 8]



[Drawing 9]



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#3 #4

JP-2002-071335 A

Substrate position detector e.g. for liquid crystal substrate, calculates ...

CLAIMS

[Claim(s)]

[Claim 1] Substrate location detection equipment characterized by providing the following. A cassette which contains a rectangular substrate conveyed by robot in a flat surface The 1st sensor which detects at least two locations in any one side of the substrate in this cassette The XY direction slider which is formed near said cassette and supports said 1st sensor movable in the direction of X, and the direction of Y The 2nd sensor which detects at least one location in the other sides which are established in said robot's arm and adjoin said one side of said substrate, and a control unit which calculates a location of a substrate in said cassette from a detection location of each of said side while controlling actuation over said robot and the XY direction slider

[Claim 2] Substrate location detection equipment characterized by providing the following. A cassette which contains a rectangular substrate conveyed by robot in a flat surface The 3rd sensor and 4th sensor which detect at least two locations in any one side of the substrate in said cassette, respectively The direction slider of X of each 1 [which is prepared near said cassette and supports said the 3rd sensor and 4th sensor movable in the direction of X independently, respectively] A control unit which calculates a location of a substrate in said cassette from a detection location of each of said side while controlling actuation over the 2nd sensor which detects at least one location in the other sides which are established in said robot's arm and adjoin said one side of said substrate, and said robot and said direction slider of X of each 1

[Claim 3] Substrate location detection equipment characterized by providing the following. A cassette which contains a rectangular substrate conveyed by robot in a flat surface The 3rd sensor and 4th sensor which detect at least two locations in any one side of the substrate in said cassette, respectively The direction slider of X of each 1 [which is prepared near said cassette and supports said the 3rd sensor and 4th sensor movable in the direction of X independently, respectively] The control unit which calculates the location of a substrate in said cassette from the detection location of each of said side while controlling actuation over the 5th sensor which detects at least one location in the other sides which adjoin said one side of said substrate, the direction slider of Y which is formed near said cassette and supports said 5th sensor movable in the direction of Y, said robot and said X direction each slider, and the direction slider of Y

[Claim 4] Substrate location detection equipment characterized by providing the following. A cassette which contains a rectangular substrate conveyed by robot in a flat surface The 1st sensor which detects at least two locations in any one side of the substrate in this cassette The XY direction slider which is formed near said cassette and supports said 1st sensor movable in the direction of X, and the direction of Y The control unit which calculates a location of a substrate in said cassette from the detection location of each of said side while controlling actuation over the 5th sensor which detects at least one location in the other sides which adjoin said one side of said substrate, the direction slider of Y which is formed near said cassette and supports said 5th sensor movable in the direction of Y, said robot and the XY direction slider, and the direction slider of Y

[Claim 5] Substrate location detection equipment characterized by providing the following. A cassette which contains a rectangular substrate conveyed by robot in a flat surface The 6th sensor and 7th sensor which detect at least two locations in any one side of the substrate in said cassette The 8th sensor which detects at least one location in the other sides which adjoin said one side of said substrate A control unit which calculates a location of a substrate in said cassette from a detection location of each of said side

while controlling actuation over the direction slider of slant which is formed near said cassette and supports simultaneously said 6th sensor, the 7th sensor, and the 8th sensor movable in the direction of slant to said each side, and said robot and the direction slider of slant

[Claim 6] Substrate location detection equipment characterized by providing the following. A cassette which contains a rectangular substrate conveyed by robot in a flat surface The 3rd sensor and 4th sensor which detect at least two locations in any one side of the substrate in said cassette, respectively The direction of X simultaneous slider which is formed near said cassette and supports said the 3rd sensor and 4th sensor movable in the direction of X simultaneously The control unit which calculates a location of a substrate in said cassette from the detection location of each of said side while controlling actuation over the 5th sensor which detects at least one location in the other sides which adjoin said one side of said substrate, the direction slider of Y which is formed near [said] the cassette and supports said 5th sensor movable in the direction of Y, said robot and the direction of X simultaneous slider, and the direction slider of Y

[Claim 7] Substrate location detection equipment characterized by providing the following. A cassette which contains a rectangular substrate conveyed by robot in a flat surface The 3rd sensor and 4th sensor which detect at least two locations in any one side of the substrate in said cassette The direction of X simultaneous slider which is formed near said cassette and supports said the 3rd sensor and 4th sensor movable in the direction of X simultaneously The 2nd sensor which detects at least one location in the other sides which are established in said robot's arm and adjoin said one side of said substrate, and a control unit which calculates a location of a substrate in said cassette from a detection location of each of said side while controlling actuation over said robot and the direction of X simultaneous slider

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[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to the substrate location detection equipment which uses for detecting whether said substrate is carrying out the location gap within the cassette which has stored the substrate conveyed with a robot.
[0002]
[Description of the Prior Art] It is desirable to contain and support said two or more substrates without a location gap to the cassette which contains substrates, such as a liquid crystal substrate, and conveys between equipment with a robot. Generally, a substrate is placed into a cassette in the angle-tolerance appointed beforehand and a location-tolerance. Moreover, in order to make haulage of a cassette easy, own bearing of a cassette and the precision of a location are designed somewhat gently. For this reason, by the robot of a teaching playback system, there was a case where that substrate could not be inserted in the right location in a processing chamber even if it can contact the substrate of a drawer lever to a cassette or can pull it out, with the location gap of the substrate carried out. For this reason, the right location in the cassette of a substrate is detected, and it is necessary to amend that location and to take out.
[0003] On the other hand, the positioning technology for substrate conveyance which can detect the location to the cassette of a substrate correctly to this is shown for example, in the patent No. 2683208 official report. This has a robot with the X-axis for conveying a substrate, R shaft, and theta shaft, and the sensor is formed on the robot arm in one fixed position other than two or more pieces and a robot arm, respectively for substrate location sensing.
[0004] By such robot, in case an arm is lengthened almost at right angles to the substrate front end to the substrate in a cassette, two sensors detect the substrate front end (front side). Since the detected location is obtained as a distance of a robot's R shaft orientations, it can ask for the inclination and location of a substrate by count from this distance and the distance between [of said two pieces] sensors. Thus, a robot's theta shaft and R shaft are amended and it is made for an arm to come to a right location to a substrate with the inclination and location of a substrate which were obtained. Then, after lifting a substrate, return and a substrate are pulled out to the first location. In addition, the way things stand, a gap of X shaft orientations is transferred to a processing chamber, after amending by the sensor of the fixed position prepared separately detecting a gap of those X shaft orientations, since it is not amended.
[0005]
[Problem(s) to be Solved by the Invention] However, if it is in the detection method of this conventional substrate location, since it is necessary to form two or more sensors on a robot's arm for location sensing of a substrate, it becomes a cost rise, and also leading about of a sensor cable becomes troublesome. Moreover, since sensing of a substrate location is needed whenever it picks out a substrate from a cassette, an excess takes time amount for sensing, and a tact time becomes long. Furthermore, in order to amend a gap of X shaft orientations of a substrate, the substrate had to be carried to somewhere else (to the location of a substrate location sensor), and there was inconvenience that the installation space of a sensor had to be secured, together with a tact time becoming long. Moreover, when pulling out a substrate, there was a case where a gap of the X-axis rubbed against ** and a cassette from a seal. Furthermore, since the robot itself was used for sensing, the technical problem that the detection precision of a location was bad occurred.

[0006] While this invention solves said technical problem, lessening the number of sensors for location sensing of the substrate formed in a robot's arm and realizing wiring by the side of a robot, easy-izing of data processing, and low cost-ization, it aims at obtaining the substrate location detection equipment which can detect a substrate location to high degree of accuracy, attaining shortening of the tight time for location sensing.
[0007]
[Means for Solving the Problem] Substrate location detection equipment applied to this invention for said object achievement A cassette which contains a rectangular substrate conveyed by robot in a flat surface, The 1st sensor which detects at least two locations in any one side of the substrate in this cassette, The XY direction slider which is formed near said cassette and supports said 1st sensor movable in the direction of X, and the direction of Y, It is prepared in said robot's arm and the 2nd sensor which detects at least one location in the other sides which adjoin said one side of said substrate is formed. While making a control unit control actuation over said robot and the XY direction slider, it is made to make a location of a substrate in said cassette calculate from a detection location of each of said side.
[0008] Moreover, a cassette which contains a rectangular substrate with which substrate location detection equipment concerning this invention is conveyed by robot in a flat surface, The 3rd sensor and 4th sensor which detect at least two locations in any one side of the substrate in said cassette, respectively, The direction slider of X of each 1 [which is prepared near said cassette and supports said the 3rd sensor and 4th sensor movable in the direction of X independently, respectively], It is prepared in said robot's arm and has the 2nd sensor which detects at least one location in the other sides which adjoin said one side of said substrate. While making a control unit control actuation over said robot and said direction slider of Y of each 1, it is made to make a location of a substrate in said cassette calculate from a detection location of each of said side.
[0009] Moreover, a cassette which contains a rectangular substrate with which substrate location detection equipment concerning this invention is conveyed by robot in a flat surface, The 3rd sensor and 4th sensor which detect at least two locations in any one side of the substrate in said cassette, respectively, The direction slider of X of each 1 [which is prepared near said cassette and supports said the 3rd sensor and 4th sensor movable in the direction of X independently, respectively], The 5th sensor which detects at least one location in the other sides which adjoin said one side of said substrate, While being prepared near said cassette, forming the direction slider of Y which supports said 5th sensor movable in the direction of Y and making a control unit control actuation over said robot and said X direction each slider, and the direction slider of Y It is made to make a location of a substrate in said cassette calculate from a detection location of each of said side.
[0010] Moreover, a cassette which contains a rectangular substrate with which substrate location detection equipment concerning this invention is conveyed by robot in a flat surface, The 1st sensor which detects at least two locations in any one side of the substrate in this cassette, The XY direction slider which is formed near said cassette and supports said 1st sensor movable in the direction of X, and the direction of Y, The 5th sensor which detects at least one location in the other sides which adjoin said one side of said substrate, While being prepared near said cassette, forming the direction slider of Y which supports said 5th sensor movable in the direction of Y and making a control unit control actuation over said robot and the XY direction slider, and the direction slider of Y It is made to make a location of a substrate in said cassette calculate from a detection location of each of said side.
[0011] Moreover, a cassette which contains a rectangular substrate with which substrate location detection equipment concerning this invention is conveyed by robot in a flat surface, The 6th sensor and 7th sensor which detect at least two locations in any one side of the substrate in said cassette, The 8th sensor which detects at least one location in the other sides which adjoin said one side of said substrate, It is prepared near said cassette and the direction slider of slant which supports simultaneously said 6th sensor, the 7th sensor, and the 8th sensor movable in the direction of slant to said each side is formed. While making a control unit control actuation over said robot and the direction slider of slant, it is made to make a location of a substrate in said cassette calculate from a detection location of each of said side.
[0012] Moreover, a cassette which contains a rectangular substrate with which substrate location detection equipment concerning this invention is conveyed by robot in a flat surface, The 3rd sensor and 4th sensor which detect at least two locations in any one side of the substrate in said cassette, respectively, It is prepared near said cassette and the direction of X simultaneous slider which supports

said the 3rd sensor and 4th sensor movable in the direction of X simultaneously is formed. The 5th sensor which detects at least one location in the other sides which adjoin a control unit at said one side of said substrate, While making actuation over the direction slider of Y which is formed near [said] the cassette and supports said 5th sensor movable in the direction of Y, said robot and the direction of X simultaneous slider, and the direction slider of Y control It is made to make a location of a substrate in said cassette calculate from a detection location of each of said side.

[0013] Moreover, a cassette which contains a rectangular substrate with which substrate location detection equipment concerning this invention is conveyed by robot in a flat surface, The 3rd sensor and 4th sensor which detect at least two locations in any one side of the substrate in said cassette, The direction of X simultaneous slider which is formed near said cassette and supports said the 3rd sensor and 4th sensor movable in the direction of X simultaneously, It is prepared in said robot's arm and the 2nd sensor which detects at least one location in the other sides which adjoin said one side of said substrate is formed. While making a control unit control actuation over said robot and the direction of X simultaneous slider, it is made to make a location of a substrate in said cassette calculate from a detection location of each of said side.

[0014]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained about drawing. Drawing 1 and drawing 2 are the plans and front view showing notionally the whole substrate location detection equipment of this invention. In this drawing, 1 is the cassette installed in the cassette base 2, and this cassette 1 has two or more slots which contain the substrate 3 of rectangles, such as a square and a rectangle, with which the configuration and size per sheet were beforehand decided in the vertical direction. Moreover, the XY direction slider 4 is installed on the about one-cassette cassette base 2. This XY direction slider 4 has the direction slider 5 of X, and the direction slider 6 of Y, and these are supporting the sensor supporter 7 for the direction of X, and the direction of Y, enabling free sliding. Furthermore, the sensor supporter 7 is in the long side side of a substrate 3, and equips the location which counters said each slot with the 1st sensor 8, such as a photoelectric switch, respectively. In addition, if actuation is made possible by the motor with an encoder and stepping motor for location detection and position control is performed to accuracy, cylinder equipments of the XY direction slider 4, such as an air cylinder, are also usable.

[0015] Moreover, near the cassette base 2, the robot 9 with the X-axis, R shaft, and theta shaft is stationed, and the 2nd one sensor 11 is attached in this robot's 9 arm 10 edge. 12 is a control unit, it detects the location of the substrate 3 within the flat surface of said cassette 1, memorizes the location of the arm 10 of the robot 9 at the detection event, and the location of a slider 4, and functions as calculating the amount of amendments of the location of the substrate 3 in a cassette 1 from each of these location data further while it issues the command this [whose] drives a robot 9 and said XY direction slider 4. In addition, this result of an operation is used for the amendment process of the substrate location by the robot 9.

[0016] Next, actuation is explained. First, the XY direction slider 4 is driven by the command of a control unit 12, the sensor supporter 7 is moved in the direction of X with the direction slider 5 of X, and the 1st sensor 8 is inserted between the substrates 3 for every slot of a cassette 1 in the 1st direction location of Y by the direction slider 6 of Y. For this reason, these 1st sensor 8 moves so that the long side of each substrate 3 may be crossed, and it detects one location of the long side of that substrate 3. Therefore, in a location gap ****** case, the direction locations of X where the 1st sensor 8 corresponding to each substrate in a substrate 3 operates will differ from a criteria location [in a cassette 1]. A control unit 12 memorizes the location of the direction of X of the substrate 3 which these 1st sensor 8 detected.

[0017] Next, once driving under the command of the XY direction slider 4 of a control unit 2 and returning the sensor supporter 7 to the original location with the direction slider 5 of X, it is made to move to the 2nd direction location of Y with the direction slider 6 of Y, and the sensor supporter 7 is moved in the direction of X with the direction slider 5 of X in this location. And each 1st sensor 8 corresponding to a slot crosses the long side of each substrate 3 at this time, and other one direction location of X of that substrate 3 is detected. This direction location of X is also memorized by the control unit 12.

[0018] Then, the 2nd sensor 11 of a stretch and its arm 10 edge is inserted for an arm 10 between each substrate 3 towards the slot of said cassette 1 which the robot 9 started actuation by the command of the

control unit 12, and contained the substrate 3 which it is going to convey. This 2nd sensor 11 detects the direction location of X and the direction location of Y when crossing the shorter side of a substrate 3, respectively. Here, a robot 9 functions as detecting simultaneously the direction coordinate of X and the direction coordinate of Y at the time of actuation of the 2nd sensor 11 from the angle of each joint. From two locations of a rectangular (rectangle) long side and one location of a shorter side for which carried out in this way and it asked by the 1st sensor 8 and 2nd sensor 11, a control unit 12 can ask for the location of the substrate 3 in the cassette 1 in a home position by the operation.

[0019] Generally, the rectangular location and rectangular angle within a secondary flat surface are determined by the coordinate value of the intersection of two straight lines which cross the one side or the two parallel sides, and the coordinate value of an intersection with the straight line which crosses the side and another side which is a right angle. He is trying to ask for the location of the substrate 3 in a secondary flat surface in this invention from the intersection of two intersections with the straight line which crosses the long side of a substrate 3, and the straight line which joins a shorter side.

[0020] Drawing 3 (a) thru/or (f) are drawings which explain the principle which can pinpoint the location of this substrate 3 from three locations on the substrate 3 of said rectangle. According to this, as shown in drawing 3 (a), the rectangular substrate 3 placed into the flat surface is difficult for generally detecting the center position n, although a location is decided by inclination theta to the coordinate (xo, yo) of the center position n, and the X-axis of a shorter side. Moreover, as shown in drawing 3 (b), even if only the coordinate on the one side of a substrate 3 (x1, y1) is given, the location of the substrate 3 and a position are not decided. Furthermore, although an inclination is decided when two coordinates (x1, y1), and (x2, y2) are given on the one side of a substrate 3 as shown in drawing 3 (c), on the line which connects two coordinates, a location changes and a location is not decided. Moreover, as shown in drawing 3 (d), also when one coordinate each (x1, y1), and (x2, y2) are given on the two sides where a substrate 3 adjoins each other, the location and inclination of the substrate are not decided. However, as shown in drawing 3 (e), the location and position of a substrate 3 will not be decided without one coordinate (x3, y3) on other sides which adjoin each other on the one side of a substrate 3 two coordinates (x1, y1), (x2, y2), and its side as one. This invention uses the principle of this drawing 3 (e).

[0021] Drawing 4 shows notionally other substrate location detection equipments which detect the location of the substrate 3 based on two locations of one side in the rectangular substrate 3, and one location of the other sides, using the above principles. A different place from what this showed to drawing 1 is having formed the two direction sliders 17 and 18 of X which replace with said XY direction slider 4, and have the sensor supporters 15 and 16 of each 1 with which the 3rd sensor 13 and 4th sensor 14 which detect two locations of the long side of a substrate 3 according to an individual were formed. In this case, when the direction sliders 17 and 18 of X move in the direction of X uniquely, accuracy can be asked for said location of the substrate [in / similarly / a cassette 1] 3 with two locations which the 3rd sensor 13 and 4th sensor 14 detect, and one location which the 2nd sensor 8 by the side of a robot 9 detects.

[0022] Drawing 5 is replaced with the 2nd sensor 11 prepared for the robot 9 which shows drawing 4 , shows the thing using the 5th sensor 19 which detects one location of the shorter side of a substrate 3, and forms this 5th sensor 19 on the sensor supporter 21 to which it is moved by the direction slider 20 of Y. In this case, the location of a substrate 3 can be pinpointed with one location of the shorter side which adjoins two locations of the long side of a substrate 3, and this. Moreover, since a sensor is not prepared for a robot 9, deterioration of the detection precision resulting from the error of the circumference of the joint produced to the robot itself etc. is beforehand avoidable.

[0023] Drawing 6 is replaced with the 2nd sensor 11 prepared for the robot 9 which shows drawing 1 , shows the thing using the 5th sensor 19 which detects one location of the shorter side of a substrate 3, and forms this 5th sensor 19 on the sensor supporter 21 to which it is moved by the direction slider 20 of Y. Deterioration of the detection precision which originated in the error produced to the robot itself like what showed drawing 5 also in this example can be prevented beforehand.

[0024] The 6th sensor 22 and 7th sensor 23 which detect at least two locations of the long side whose drawing 7 is any one side of the substrate 3 in a cassette 1, The 8th sensor 24 which detects at least one location of the shorter side which are the other sides which adjoin said one side is attached on the sensor supporters 25 and 26 of each 1, and 27. These sensor supporter material 25, 26, and 27 is attached in the direction of slant on the direction slider 28 of slant simultaneously made movable to said each side. According to this gestalt, abbreviation coincidence can be made to cross each sensors 22, 23, and 24 of

all by migration of the single direction of the direction slider 28 of slant to two places of the long side of a substrate 3, and one place of a shorter side. By this, the detection speed of a substrate location will improve.
[0025] Moreover, drawing 8 is the modification of drawing 5 and installs the sensor supporters 15 and 16 with which this was equipped with the 3rd sensor 13 and 4th sensor 14 on the one direction of X simultaneous slider 29. As shown in drawing 5 , in order not to operate a separate slider independently according to this, the location detection speed of a substrate 3 becomes early, and becomes possible [suppressing the detection error based on each slider 17 of drawing 5 , and the size error between 18]. Moreover, the simplification and low-cost-izing of a slider style are realizable. Furthermore, drawing 9 installs ** which is the modification of drawing 4 , and the sensor supporters 15 and 16 with which this was equipped with the 3rd sensor 13 and 4th sensor 14 on the one direction of X simultaneous slider 29. Also in this case, as well as the case of drawing 8 , can make the long side of a substrate cross simultaneously with the one direction of X simultaneous slider 29, and the detection speed of a substrate location becomes early about two sensors 13 and 14, and also the simplification and low-cost-izing of a slider style are realizable.
[0026] In addition, in the above, although the case where each sensor was moved to the substrate 3 in the fixed cassette was described, each sensor is fixed, and even if it makes it move a cassette to the sensor, the same effect is acquired. Moreover, in order to reduce the amount of the sensor used, you may make it use also [detection / for every slot / substrate location], without forming each sensor for every slot, as the sensor of one or a fraction is moved in the vertical direction of a cassette. According to this, it can contribute to the further cost reduction.
[0027]
[Effect of the Invention] According to this invention, as mentioned above, near the cassette which contained the substrate,The sensor supporter in which migration by the robot and the slider is possible is arranged. By moving at least two sensors formed in these so that one side of a substrate may be crossed, and making it move so that the other sides which adjoin said one side in at least one sensor may be crossed further Three locations on a substrate are made detectable, with the location gap in the cassette of a substrate can be detected to high degree of accuracy by the amount of the minimum sensor used in a short time. Moreover, in not forming a sensor on a robot's arm, the wiring by the side of a robot and data processing become easy, and also it is beforehand avoidable that the error which the robot itself has has an adverse effect on a location detection result. Furthermore, since the location of a substrate and an angle are called for by once in a 2-dimensional flat surface, a substrate is specially pulled out from a cassette like the conventional technology, the excessive process of carrying out sensing in other locations is less necessary, and a tact time can be shortened. moreover, the thing for which location detection is simultaneously performed about each substrate within the slot of the plurality in a cassette using the sensor formed for every slot -- many -- the effect that the tact time of several substrates location detection can be shortened is acquired.

[Translation done.]

TECHNICAL FIELD

[A technical field to which invention belongs] This invention relates to substrate location detection equipment which uses for detecting whether said substrate is carrying out the location gap within a cassette which has stored a substrate conveyed with a robot.

[Translation done.]

PRIOR ART

[Description of the Prior Art] It is desirable to contain and support said two or more substrates without a location gap to the cassette which contains substrates, such as a liquid crystal substrate, and conveys between equipment with a robot. Generally, a substrate is placed into a cassette in the angle-tolerance appointed beforehand and a location-tolerance. Moreover, in order to make haulage of a cassette easy, own bearing of a cassette and the precision of a location are designed somewhat gently. For this reason, by the robot of a teaching playback system, there was a case where that substrate could not be inserted in the right location in a processing chamber even if it can contact the substrate of a drawer lever to a cassette or can pull it out, with the location gap of the substrate carried out. For this reason, the right location in the cassette of a substrate is detected, and it is necessary to amend that location and to take out.

[0003] On the other hand, the positioning technology for substrate conveyance which can detect the location to the cassette of a substrate correctly to this is shown for example, in the patent No. 2683208 official report. This has a robot with the X-axis for conveying a substrate, R shaft, and theta shaft, and the sensor is formed on the robot arm in one fixed position other than two or more pieces and a robot arm, respectively for substrate location sensing.

[0004] By such robot, in case an arm is lengthened almost at right angles to the substrate front end to the substrate in a cassette, two sensors detect the substrate front end (front side). Since the detected location is obtained as a distance of a robot's R shaft orientations, it can ask for the inclination and location of a substrate by count from this distance and the distance between [of said two pieces] sensors. Thus, a robot's theta shaft and R shaft are amended and it is made for an arm to come to a right location to a substrate with the inclination and location of a substrate which were obtained. Then, after lifting a substrate, return and a substrate are pulled out to the first location. In addition, the way things stand, a gap of X shaft orientations is transferred to a processing chamber, after amending by the sensor of the fixed position prepared separately detecting a gap of those X shaft orientations, since it is not amended.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, according to this invention, near the cassette which contained the substrate, arrange the sensor supporter in which migration by the robot and the slider is possible, and cross one side of a substrate for at least two sensors formed in these. Detection of three locations on a substrate is enabled by making it move and making it move so that the other sides which adjoin said one side in at least one sensor may be crossed further, with the location gap in the cassette of a substrate can be detected to high degree of accuracy by the amount of the minimum sensor used in a short time. Moreover, in not forming a sensor on a robot's arm, the wiring by the side of a robot and data processing become easy, and also it is beforehand avoidable that the error which the robot itself has has an adverse effect on a location detection result. Furthermore, since the location of a substrate and an angle are called for by once in a 2-dimensional flat surface, a substrate is specially pulled out from a cassette like the conventional technology, the excessive process of carrying out sensing in other locations is less necessary, and a tact time can be shortened. moreover, the thing for which location detection is simultaneously performed about each substrate within the slot of the plurality in a cassette using the sensor formed for every slot -- many -- the effect that the tact time of several substrates location detection can be shortened is acquired.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, if it is in the detection method of this conventional substrate location, since it is necessary to form two or more sensors on a robot's arm for location sensing of a substrate, it becomes a cost rise, and also leading about of a sensor cable becomes troublesome. Moreover, since sensing of a substrate location is needed whenever it picks out a substrate from a cassette, an excess takes time amount for sensing, and a tact time becomes long. Furthermore, in order to amend a gap of X shaft orientations of a substrate, the substrate had to be carried to somewhere else (to the location of a substrate location sensor), and there was inconvenience that the installation space of a sensor had to be secured, together with a tact time becoming long. Moreover, when pulling out a substrate, there was a case where a gap of the X-axis rubbed against ** and a cassette from a seal. Furthermore, since the robot itself was used for sensing, the technical problem that the detection precision of a location was bad occurred.
[0006] While this invention solves said technical problem, lessening the number of sensors for location sensing of the substrate formed in a robot's arm and realizing wiring by the side of a robot, easy-izing of data processing, and low cost-ization, it aims at obtaining the substrate location detection equipment which can detect a substrate location to high degree of accuracy, attaining shortening of the tight time for location sensing.

[Translation done.]

MEANS

[Means for Solving the Problem] Substrate location detection equipment applied to this invention for said object achievement A cassette which contains a rectangular substrate conveyed by robot in a flat surface, The 1st sensor which detects at least two locations in any one side of the substrate in this cassette, The XY direction slider which is formed near said cassette and supports said 1st sensor movable in the direction of X, and the direction of Y, It is prepared in said robot's arm and the 2nd sensor which detects at least one location in the other sides which adjoin said one side of said substrate is formed. While making a control unit control actuation over said robot and the XY direction slider, it is made to make a location of a substrate in said cassette calculate from a detection location of each of said side.

[0008] Moreover, a cassette which contains a rectangular substrate with which substrate location detection equipment concerning this invention is conveyed by robot in a flat surface, The 3rd sensor and 4th sensor which detect at least two locations in any one side of the substrate in said cassette, respectively, The direction slider of X of each 1 [which is prepared near said cassette and supports said the 3rd sensor and 4th sensor movable in the direction of X independently, respectively], It is prepared in said robot's arm and has the 2nd sensor which detects at least one location in the other sides which adjoin said one side of said substrate. While making a control unit control actuation over said robot and said direction slider of Y of each 1, it is made to make a location of a substrate in said cassette calculate from a detection location of each of said side.

[0009] Moreover, a cassette which contains a rectangular substrate with which substrate location detection equipment concerning this invention is conveyed by robot in a flat surface, The 3rd sensor and 4th sensor which detect at least two locations in any one side of the substrate in said cassette, respectively, The direction slider of X of each 1 [which is prepared near said cassette and supports said the 3rd sensor and 4th sensor movable in the direction of X independently, respectively], The 5th sensor which detects at least one location in the other sides which adjoin said one side of said substrate, While being prepared near said cassette, forming the direction slider of Y which supports said 5th sensor movable in the direction of Y and making a control unit control actuation over said robot and said X direction each slider, and the direction slider of Y It is made to make a location of a substrate in said cassette calculate from a detection location of each of said side.

[0010] Moreover, a cassette which contains a rectangular substrate with which substrate location detection equipment concerning this invention is conveyed by robot in a flat surface, The 1st sensor which detects at least two locations in any one side of the substrate in this cassette, The XY direction slider which is formed near said cassette and supports said 1st sensor movable in the direction of X, and the direction of Y, The 5th sensor which detects at least one location in the other sides which adjoin said one side of said substrate, While being prepared near said cassette, forming the direction slider of Y which supports said 5th sensor movable in the direction of Y and making a control unit control actuation over said robot and the XY direction slider, and the direction slider of Y It is made to make a location of a substrate in said cassette calculate from a detection location of each of said side.

[0011] Moreover, a cassette which contains a rectangular substrate with which substrate location detection equipment concerning this invention is conveyed by robot in a flat surface, The 6th sensor and 7th sensor which detect at least two locations in any one side of the substrate in said cassette, The 8th sensor which detects at least one location in the other sides which adjoin said one side of said substrate, It is prepared near said cassette and the direction slider of slant which supports simultaneously said 6th

sensor, the 7th sensor, and the 8th sensor movable in the direction of slant to said each side is formed. While making a control unit control actuation over said robot and the direction slider of slant, it is made to make a location of a substrate in said cassette calculate from a detection location of each of said side.
[0012] Moreover, a cassette which contains a rectangular substrate with which substrate location detection equipment concerning this invention is conveyed by robot in a flat surface, The 3rd sensor and 4th sensor which detect at least two locations in any one side of the substrate in said cassette, respectively, It is prepared near said cassette and the direction of X simultaneous slider which supports said the 3rd sensor and 4th sensor movable in the direction of X simultaneously is formed. The 5th sensor which detects at least one location in the other sides which adjoin a control unit at said one side of said substrate, While making actuation over the direction slider of Y which is formed near [said] the cassette and supports said 5th sensor movable in the direction of Y, said robot and the direction of X simultaneous slider, and the direction slider of Y control It is made to make a location of a substrate in said cassette calculate from a detection location of each of said side.
[0013] Moreover, a cassette which contains a rectangular substrate with which substrate location detection equipment concerning this invention is conveyed by robot in a flat surface, The 3rd sensor and 4th sensor which detect at least two locations in any one side of the substrate in said cassette, The direction of X simultaneous slider which is formed near said cassette and supports said the 3rd sensor and 4th sensor movable in the direction of X simultaneously, It is prepared in said robot's arm and the 2nd sensor which detects at least one location in the other sides which adjoin said one side of said substrate is formed. While making a control unit control actuation over said robot and the direction of X simultaneous slider, it is made to make a location of a substrate in said cassette calculate from a detection location of each of said side.
[0014]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained about drawing. Drawing 1 and drawing 2 are the plans and front view showing notionally the whole substrate location detection equipment of this invention. In this drawing, 1 is the cassette installed in the cassette base 2, and this cassette 1 has two or more slots which contain the substrate 3 of rectangles, such as a square and a rectangle, with which the configuration and size per sheet were beforehand decided in the vertical direction. Moreover, the XY direction slider 4 is installed on the about one-cassette cassette base 2. This XY direction slider 4 has the direction slider 5 of X, and the direction slider 6 of Y, and these are supporting the sensor supporter 7 for the direction of X, and the direction of Y, enabling free sliding. Furthermore, the sensor supporter 7 is in the long side side of a substrate 3, and equips the location which counters said each slot with the 1st sensor 8, such as a photoelectric switch, respectively. In addition, if actuation is made possible by the motor with an encoder and stepping motor for location detection and position control is performed to accuracy, cylinder equipments of the XY direction slider 4, such as an air cylinder, are also usable.
[0015] Moreover, near the cassette base 2, the robot 9 with the X-axis, R shaft, and theta shaft is stationed, and the 2nd one sensor 11 is attached in this robot's 9 arm 10 edge. 12 is a control unit, it detects the location of the substrate 3 within the flat surface of said cassette 1, memorizes the location of the arm 10 of the robot 9 at the detection event, and the location of a slider 4, and functions as calculating the amount of amendments of the location of the substrate 3 in a cassette 1 from each of these location data further while it issues the command this [whose] drives a robot 9 and said XY direction slider 4. In addition, this result of an operation is used for the amendment process of the substrate location by the robot 9.
[0016] Next, actuation is explained. First, the XY direction slider 4 is driven by the command of a control unit 12, the sensor supporter 7 is moved in the direction of X with the direction slider 5 of X, and the 1st sensor 8 is inserted between the substrates 3 for every slot of a cassette 1 in the 1st direction location of Y by the direction slider 6 of Y. For this reason, these 1st sensor 8 moves so that the long side of each substrate 3 may be crossed, and it detects one location of the long side of that substrate 3. Therefore, in a location gap ****** case, the direction locations of X where the 1st sensor 8 corresponding to each substrate in a substrate 3 operates will differ from a criteria location [in a cassette 1]. A control unit 12 memorizes the location of the direction of X of the substrate 3 which these 1st sensor 8 detected.
[0017] Next, once driving under the command of the XY direction slider 4 of a control unit 2 and returning the sensor supporter 7 to the original location with the direction slider 5 of X, it is made to

move to the 2nd direction location of Y with the direction slider 6 of Y, and the sensor supporter 7 is moved in the direction of X with the direction slider 5 of X in this location. And each 1st sensor 8 corresponding to a slot crosses the long side of each substrate 3 at this time, and other one direction location of X of that substrate 3 is detected. This direction location of X is also memorized by the control unit 12.

[0018] Then, the 2nd sensor 11 of a stretch and its arm 10 edge is inserted for an arm 10 between each substrate 3 towards the slot of said cassette 1 which the robot 9 started actuation by the command of the control unit 12, and contained the substrate 3 which it is going to convey. This 2nd sensor 11 detects the direction location of X and the direction location of Y when crossing the shorter side of a substrate 3, respectively. Here, a robot 9 functions as detecting simultaneously the direction coordinate of X and the direction coordinate of Y at the time of actuation of the 2nd sensor 11 from the angle of each joint. From two locations of a rectangular (rectangle) long side and one location of a shorter side for which carried out in this way and it asked by the 1st sensor 8 and 2nd sensor 11, a control unit 12 can ask for the location of the substrate 3 in the cassette 1 in a home position by the operation.

[0019] Generally, the rectangular location and rectangular angle within a secondary flat surface are determined by the coordinate value of the intersection of two straight lines which cross the one side or the two parallel sides, and the coordinate value of an intersection with the straight line which crosses the side and another side which is a right angle. He is trying to ask for the location of the substrate 3 in a secondary flat surface in this invention from the intersection of two intersections with the straight line which crosses the long side of a substrate 3, and the straight line which joins a shorter side.

[0020] Drawing 3 (a) thru/or (f) are drawings which explain the principle which can pinpoint the location of this substrate 3 from three locations on the substrate 3 of said rectangle. According to this, as shown in drawing 3 (a), the rectangular substrate 3 placed into the flat surface is difficult for generally detecting the center position n, although a location is decided by inclination theta to the coordinate (xo, yo) of the center position n, and the X-axis of a shorter side. Moreover, as shown in drawing 3 (b), even if only the coordinate on the one side of a substrate 3 (x1, y1) is given, the location of the substrate 3 and a position are not decided. Furthermore, although an inclination is decided when two coordinates (x1, y1), and (x2, y2) are given on the one side of a substrate 3 as shown in drawing 3 (c), on the line which connects two coordinates, a location changes and a location is not decided. Moreover, as shown in drawing 3 (d), also when one coordinate each (x1, y1), and (x2, y2) are given on the two sides where a substrate 3 adjoins each other, the location and inclination of the substrate are not decided. However, as shown in drawing 3 (e), the location and position of a substrate 3 will not be decided without one coordinate (x3, y3) on other sides which adjoin each other on the one side of a substrate 3 two coordinates (x1, y1), (x2, y2), and its side as one. This invention uses the principle of this drawing 3 (e).

[0021] Drawing 4 shows notionally other substrate location detection equipments which detect the location of the substrate 3 based on two locations of one side in the rectangular substrate 3, and one location of the other sides, using the above principles. A different place from what this showed to drawing 1 is having formed the two direction sliders 17 and 18 of X which replace with said XY direction slider 4, and have the sensor supporters 15 and 16 of each 1 with which the 3rd sensor 13 and 4th sensor 14 which detect two locations of the long side of a substrate 3 according to an individual were formed. In this case, when the direction sliders 17 and 18 of X move in the direction of X uniquely, accuracy can be asked for said location of the substrate [in / similarly / a cassette 1] 3 with two locations which the 3rd sensor 13 and 4th sensor 14 detect, and one location which the 2nd sensor 8 by the side of a robot 9 detects.

[0022] Drawing 5 is replaced with the 2nd sensor 11 prepared for the robot 9 which shows drawing 4 , shows the thing using the 5th sensor 19 which detects one location of the shorter side of a substrate 3, and forms this 5th sensor 19 on the sensor supporter 21 to which it is moved by the direction slider 20 of Y. In this case, the location of a substrate 3 can be pinpointed with one location of the shorter side which adjoins two locations of the long side of a substrate 3, and this. Moreover, since a sensor is not prepared for a robot 9, deterioration of the detection precision resulting from the error of the circumference of the joint produced to the robot itself etc. is beforehand avoidable.

[0023] Drawing 6 is replaced with the 2nd sensor 11 prepared for the robot 9 which shows drawing 1 , shows the thing using the 5th sensor 19 which detects one location of the shorter side of a substrate 3, and forms this 5th sensor 19 on the sensor supporter 21 to which it is moved by the direction slider 20 of Y. Deterioration of the detection precision which originated in the error produced to the robot itself like

what showed drawing 5 also in this example can be prevented beforehand.
[0024] The 6th sensor 22 and 7th sensor 23 which detect at least two locations of the long side whose drawing 7 is any one side of the substrate 3 in a cassette 1, The 8th sensor 24 which detects at least one location of the shorter side which are the other sides which adjoin said one side is attached on the sensor supporters 25 and 26 of each 1, and 27. These sensor supporter material 25, 26, and 27 is attached in the direction of slant on the direction slider 28 of slant simultaneously made movable to said each side. According to this gestalt, abbreviation coincidence can be made to cross each sensors 22, 23, and 24 of all by migration of the single direction of the direction slider 28 of slant to two places of the long side of a substrate 3, and one place of a shorter side. By this, the detection speed of a substrate location will improve.
[0025] Moreover, drawing 8 is the modification of drawing 5 and installs the sensor supporters 15 and 16 with which this was equipped with the 3rd sensor 13 and 4th sensor 14 on the one direction of X simultaneous slider 29. As shown in drawing 5 , in order not to operate a separate slider independently according to this, the location detection speed of a substrate 3 becomes early, and becomes possible [suppressing the detection error based on each slider 17 of drawing 5 , and the size error between 18]. Moreover, the simplification and low-cost-izing of a slider style are realizable. Furthermore, drawing 9 installs ** which is the modification of drawing 4 , and the sensor supporters 15 and 16 with which this was equipped with the 3rd sensor 13 and 4th sensor 14 on the one direction of X simultaneous slider 29. Also in this case, as well as the case of drawing 8 , can make the long side of a substrate cross simultaneously with the one direction of X simultaneous slider 29, and the detection speed of a substrate location becomes early about two sensors 13 and 14, and also the simplification and low-cost-izing of a slider style are realizable.
[0026] In addition, in the above, although the case where each sensor was moved to the substrate 3 in the fixed cassette was described, each sensor is fixed, and even if it makes it move a cassette to the sensor, the same effect is acquired. Moreover, in order to reduce the amount of the sensor used, you may make it use also [detection / for every slot / substrate location], without forming each sensor for every slot, as the sensor of one or a fraction is moved in the vertical direction of a cassette. According to this, it can contribute to the further cost reduction.

[Translation done.]

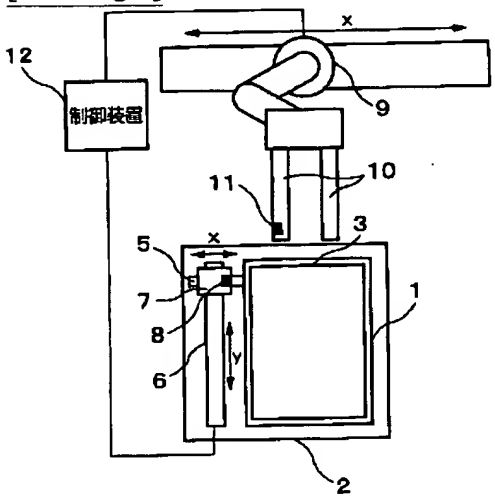
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the plan showing notionally the substrate location detection equipment by one gestalt of operation of this invention.
[Drawing 2] It is the front view showing the cassette of drawing 1 , and the relation of a sensor supporter.
[Drawing 3] It is explanatory drawing showing the substrate location detection principle by the substrate location detection equipment of this invention.
[Drawing 4] It is the plan showing notionally the substrate location detection equipment by other gestalten of operation of this invention.
[Drawing 5] It is the plan showing notionally the substrate location detection equipment by other gestalten of operation of this invention.
[Drawing 6] It is the plan showing notionally the substrate location detection equipment by other gestalten of operation of this invention.
[Drawing 7] It is the plan showing notionally the substrate location detection equipment by other gestalten of operation of this invention.
[Drawing 8] It is the plan showing notionally the substrate location detection equipment by other gestalten of operation of this invention.
[Drawing 9] It is the plan showing notionally the substrate location detection equipment by other gestalten of operation of this invention.
[Description of Notations]
1 Cassette
3 Substrate
4 The XY Direction Slider
7 Sensor Supporter
8 1st Sensor
9 Robot
11 2nd Sensor
12 Control Unit
13 3rd Sensor
14 4th Sensor
15 16 Sensor supporter
17 18 The direction slider of X
19 5th Sensor
20 The Direction Slider of Y
21 Sensor Supporter
22 6th Sensor
23 7th Sensor
24 8th Sensor
25, 26, 27 Sensor supporter
28 The Direction Slider of Slant
29 The Direction of X Simultaneous Slider

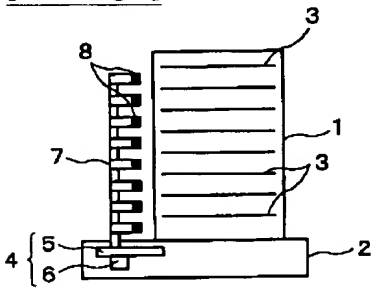
[Translation done.]

DRAWINGS

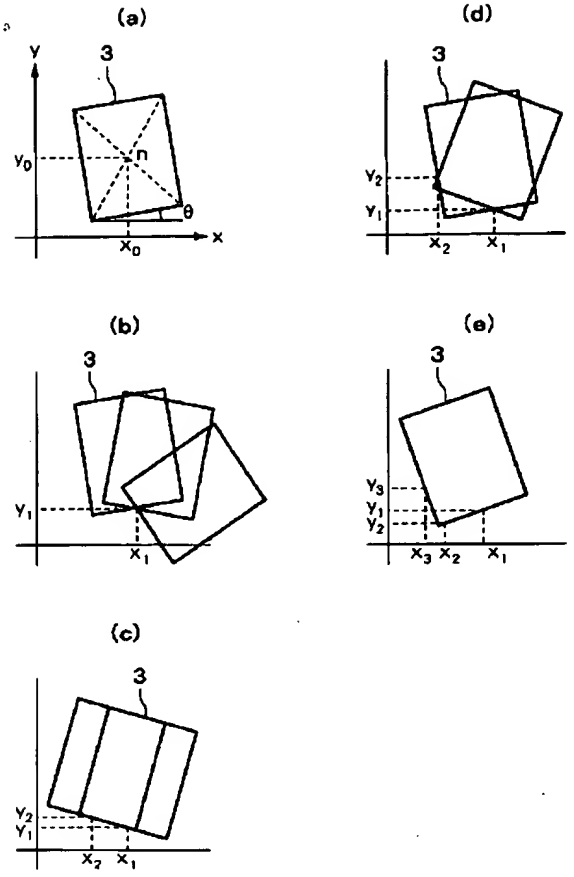
[Drawing 1]



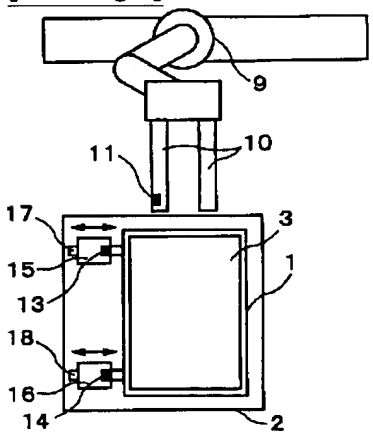
[Drawing 2]



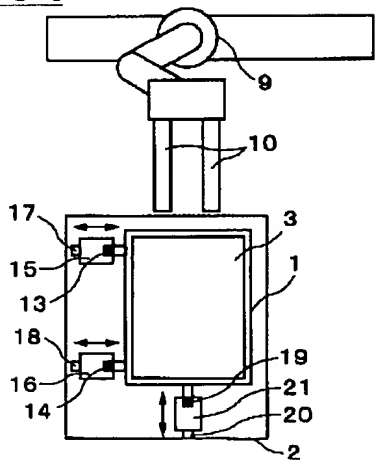
[Drawing 3]



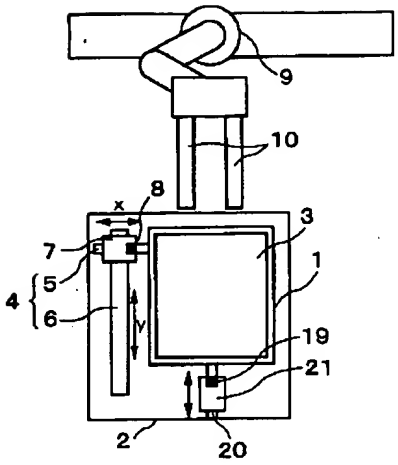
[Drawing 4]



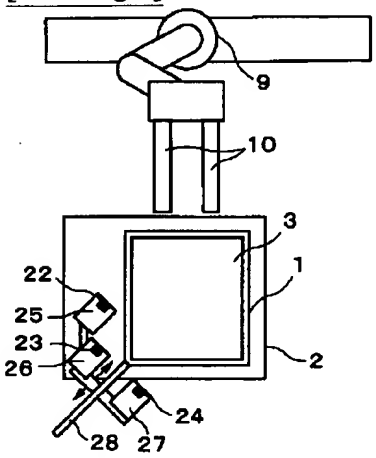
[Drawing 5]



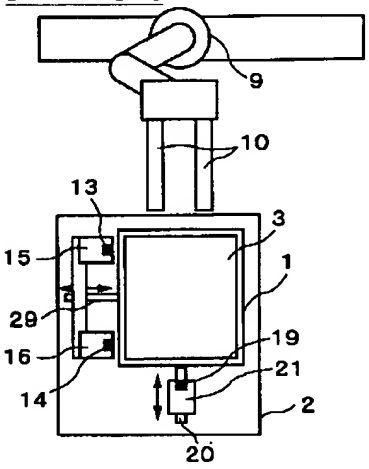
[Drawing 6]



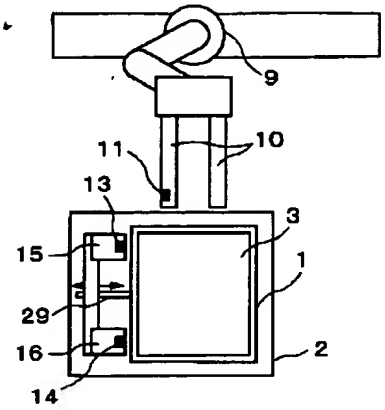
[Drawing 7]



[Drawing 8]



[Drawing 9]



[Translation done.]

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] A cassette which contains a substrate An aligner which detects a location gap of a substrate in a cassette A robot which conveys a substrate While being the substrate transport device equipped with the above, having one detection sensor which detects a location gap of said substrate while said aligner is arranged near near of said substrate so that access isolation may be carried out to a flank of said substrate and having a hand said whose robot holds said substrate, it is characterized by arranging two substrate detection sensors in the direction which intersects perpendicularly with said hand to a travelling direction.
[Claim 2] an existence sensor which detects existence of said substrate to said aligner -- said substrate -- receiving -- the upper and lower sides -- a substrate transport device according to claim 1 characterized by being arranged movable.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] It is related with the substrate transport device which this invention mainly performs alignment of a thin glass substrate, and is conveyed at degree process.
[0002]
[Description of the Prior Art] As the substrate transport device M1 which has an aligner for performing alignment of a glass substrate conventionally is shown in drawing 10 (refer to JP,9-69548,A), the 1st distance robot 51 is installed in two places near the side of glass substrate W contained by Cassette C. And if a predetermined location is equipped with the cassette C by which glass substrate W is contained, the 1st two distance robot 51 will move in the direction which carries out access isolation to vertical migration or glass substrate W, will detect the distance of the side of all glass substrate W, and will detect the gap to the home position of glass substrate W.
[0003] The robot 52 which conveys glass substrate W on the other hand in the location which counters the transverse plane of Cassette C is stationed, and the 2nd distance robot 53 which measures the location of the transverse-plane end face of glass substrate W to a robot 52 is attached. When the 2nd distance robot 53 measures the distance of the transverse-plane end face of glass substrate W, the location of glass substrate W is detectable by three places with the 1st distance robot 51. The current position of glass substrate W and the location of normal which were detected are compared, and in order that a robot's 52 hand section 54 may do theta revolution of to the amendment part machine base and may take out glass substrate W, it moves.
[0004]
[Problem(s) to be Solved by the Invention] However, glass substrate W contained by Cassette C does not restrict that the thing of the same magnitude is always contained, and since the division glass which cut the conventional glass substrate into 1/2 or 1/3 is used, in the 1st above-mentioned distance robot 51 arranged at two places, one 1st distance robot 51 may be unable to detect the side of glass substrate W. the magnitude of glass substrate W -- doubling -- each time -- the distance sensor 51 -- attaching -- things -- productivity -- falling -- making -- not only -- cost -- high -- becoming -- since -- the substrate gap detection method -- reexamination had to be aimed at.
[0005] This invention solves an above-mentioned technical problem, and aims at offering the substrate transport device which can measure detection of a location gap of a glass substrate irrespective of the magnitude of a glass substrate.
[0006]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, it constitutes from a substrate transport device in connection with this invention as follows. Namely, a cassette which contains a substrate and an aligner which detects a location gap of a substrate in a cassette, While it is the substrate transport device which has a robot which conveys a substrate, and said aligner is arranged near near of said substrate so that access isolation may be carried out to a flank of said substrate While having one detection sensor which detects a location gap of said substrate and having a hand said whose robot holds said substrate, it is characterized by arranging two substrate detection sensors in the direction which intersects perpendicularly with said hand to a travelling direction.
[0007] moreover, an existence sensor which detects existence of said substrate to said aligner preferably -- said substrate -- receiving -- the upper and lower sides -- what is necessary is to just be characterized

by being arranged movable
[0008]
[Embodiment of the Invention] Hereafter, the gestalt of 1 implementation of this invention is explained based on a drawing.
[0009] The transport device M of this gestalt has the cassette 1 which contains glass substrate (henceforth substrate) W, the aligner 2 installed near near the side of a cassette 1, and the robot 3 installed in the location which counters the transverse plane of a cassette 1.
[0010] In order to contain two or more substrates W in the vertical direction, the substrate supporter (not shown) which supports underside 4 corner of each substrate W is arranged, and a robot's 3 hand or the detection sensor of an aligner is formed in the cassette 1 possible [insertion]. And receipt of Substrate W installs a cassette 1 in the position (location shown in drawing 1) of a transport device M.
[0011] An aligner 2 has the movable detecting-element main part 23 in the direction which carries out access isolation at a cassette 1 side, showing around at the susceptor 21 and the rail 22 which have two rails 22 laid toward a cassette 1 side, and one sensor supporter 24 which projects toward a cassette 1 side on the detecting-element main part 23 is arranged movable in the vertical direction. In the sensor supporter 24, it has one location gap detection sensor (henceforth a position sensor) 25 which is made to project light and detects the side edge edge of Substrate W from the upper part or a lower part, and the substrate existence sensor (henceforth an existence sensor) 26 which is made to project light on the side of Substrate W, and detects the existence of Substrate W, and is constituted.
[0012] A robot 3 has the hand 31 connected with a rotatable arm object (graphic display ****) rotatable at **** (not shown), and two edge detection sensors 32 are arranged in the direction which carries out an abbreviation rectangular cross to a travelling direction on a hand 31. Furthermore, four adsorption holes 33 for carrying out adsorption maintenance of the substrate W are formed in a hand 31, and it connects with the vacuum generator which is not illustrated through a hose.
[0013] If the cassette 1 by which Substrate W was contained first is installed in a position, as shown in drawing 2 , this transport device M The detecting-element main part 23 advances toward a cassette 1 so that the head of the sensor supporter 24 of an aligner 2 may be located near this side of Substrate W. Vertical migration of between the substrates W which are in a soffit from the substrate which has the sensor supporter 24 of an aligner 2 in the upper bed of a cassette 1 is carried out, and actuation of the existence sensor 26 detects the existence of Substrate W. The reflective mold which senses the light which applied the projected light to the side of Substrate W, and was reflected is sufficient as this existence sensor 26, and it may also have floodlighting / light-receiving mold sensed by whether it will shade with Substrate W by the time the light which has a projector and an electric eye on both sides of Substrate W, and was discharged from the existence sensor 26 which is a floodlight reaches an electric eye. Furthermore, the reflective mold which the detecting-element main part 23 moves under every one substrate W, turns and projects Substrate W on the upper part from a lower part, and senses Substrate W is sufficient as the existence sensor 26. In this gestalt, the reflective mold which applies light to the side of Substrate W in the location distant from the existence sensor 26 is used like drawing 1 .
[0014] After the existence sensor 26 detects the existence of Substrate W, it is made to arrange under the substrate W which it moves [substrate] in the direction which the detecting-element main part 23 approaches toward a cassette 1 side, and has a position sensor 25 conveyed, as shown in drawing 3 -4. And a position sensor 25 detects the location of the side edge edge of Substrate W. A position sensor 25 is sent to the control unit which detects the location and does not illustrate the signal by sensing the light which projected light up and was reflected on the side edge edge of Substrate W. A location gap of the direction (the direction which intersects perpendicularly to the travelling direction of a hand 31, i.e., a robot's 3 migration direction) of Y of Substrate W is called for by measurement of a position sensor 25. Termination of location detection of Substrate W moves the detecting-element main part 23 in the direction isolated from a cassette 1.
[0015] On the other hand, a robot 3 turns a hand 31 to a cassette 1 side, and he advances a hand 31 toward a cassette 1 so that you may make it located under the substrate W whose position sensor 25 has detected the side edge edge of Substrate W and to convey, at the same time it ends at the time. Under the present circumstances, if Substrate W leans to the location of normal, as shown in drawing 5 , one edge detection sensor 32 (drawing 5 Nakamigi side) will arrive at the front end edge of Substrate W between two edge detection sensors 32 first attached in the hand 31, that location will be detected, and that signal will be sent to a control unit. Next, if a hand 31 moves forward further, as shown in drawing 6 , the edge

detection sensor 32 (left-hand side in drawing 5) of another side will arrive at the front end edge of Substrate W, the location will be detected, and the signal will be sent to a control unit. In addition, the type as the above-mentioned position sensor 25 with the same edge detection sensor 32 is used.
[0016] The location of the direction of X of Substrate W (travelling direction of a hand 31) and a location gap are calculated by measurement of two edge detection sensors 32, and theta is called for whenever [angle-of-inclination / of Substrate W]. As shown in drawing 7 , while location amendment of the robot 3 is carried out at the location gap part Y shaft orientations of Y shaft orientations together with a gap of the direction of Y detected by the above-mentioned position sensor 25 by this, a hand 31 is carried out theta angle correction to ****. Therefore, while being arranged to the leaning substrate W at parallel, a hand 31 will move forward the abbreviation center line top of Substrate W, as shown in drawing 8 . Advance of a hand 31 is performed with the movement magnitude to the direction of X of the part which amended the location gap of the direction of X. Therefore, in case a hand 31 arrives at the location which adsorbs Substrate W, as Substrate W will be held in a regular location and shown in drawing 9 after that, a hand 31 adsorbs Substrate W and takes out from a cassette 1.
[0017] In case Substrate W is conveyed by the hand 31, since it is conveyed in the condition that there is no inclination to a hand 31, when being taken out from a cassette, Substrate W does not interfere in the cassette itself and is conveyed smoothly. Moreover, in case degree process is equipped with Substrate W and it contains to a cassette again especially, since the hand has already adsorbed the substrate in the regular location, it can be conveyed in a regular predetermined location only by advance migration of a hand. That is, interference with the substrate and cassette which are easy to generate when containing the substrate in the condition of having inclined can be prevented.
[0018] The above-mentioned operation is repeated, alignment of all the substrates W in a cassette 1 will be carried out, and they will be conveyed by degree process.
[0019] In addition, especially the configuration of the sensor susceptor of an aligner is not above scrupulous, and one position sensor and one existence sensor should just be attached ** picking.
[0020]
[Effect of the Invention] The cassette by which a substrate transport device contains a substrate according to this invention, and the aligner which detects a location gap of the substrate in a cassette, While it has the robot which conveys a substrate, and said aligner is arranged near near of said substrate so that access isolation may be carried out to the flank of said substrate While having one detection sensor which detects a location gap of said substrate and having the hand said whose robot holds said substrate, two substrate detection sensors are arranged in the direction which intersects perpendicularly with said hand to a travelling direction. Said one detection sensor arranged in said aligner will detect a location gap of the direction of Y of a substrate, two substrate detection sensors arranged by said robot's hand will detect a location gap of the inclination of a substrate and the direction of X, and three sensors will perform location amendment of a hand. Therefore, even if a substrate is division glass, a location gap of the side of a substrate is surely detectable by one detection sensor. Moreover, since location amendment of the hand is beforehand carried out according to the substrate which the location gap has generated in case a substrate is adsorbed, a substrate is conveyed in the condition that there are not a hand and an inclination, to migration of X shaft orientations of a hand. Therefore, from a cassette, a substrate does not interfere in a cassette, ejection or even when being contained.
[0021] moreover, the existence sensor by which this substrate transport device detects the existence of said substrate to said aligner -- said substrate -- receiving -- the upper and lower sides -- it is arranged movable. If a receipt **** cassette is installed in a predetermined location, as for said existence sensor, said substrate will perform vertical migration immediately, in order to detect the side from the substrate of an upper bed even to the substrate of a soffit. Therefore, a robot's conveyance time amount is shortened compared with the case where the robot is equipped with the existence sensor.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[The technical field to which invention belongs] It is related with the substrate transport device which this invention mainly performs alignment of a thin glass substrate, and is conveyed at degree process.

[Translation done.]

PRIOR ART

[Description of the Prior Art] As the substrate transport device M1 which has an aligner for performing alignment of a glass substrate conventionally is shown in drawing 10 (refer to JP,9-69548,A), the 1st distance robot 51 is installed in two places near the side of glass substrate W contained by Cassette C. And if a predetermined location is equipped with the cassette C by which glass substrate W is contained, the 1st two distance robot 51 will move in the direction which carries out access isolation to vertical migration or glass substrate W, will detect the distance of the side of all glass substrate W, and will detect the gap to the home position of glass substrate W.
[0003] The robot 52 which conveys glass substrate W on the other hand in the location which counters the transverse plane of Cassette C is stationed, and the 2nd distance robot 53 which measures the location of the transverse-plane end face of glass substrate W to a robot 52 is attached. When the 2nd distance robot 53 measures the distance of the transverse-plane end face of glass substrate W, the location of glass substrate W is detectable by three places with the 1st distance robot 51. The current position of glass substrate W and the location of normal which were detected are compared, and in order that a robot's 52 hand section 54 may do theta revolution of to the amendment part machine base and may take out glass substrate W, it moves.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, a substrate transport device has the cassette which contains a substrate, the aligner which detects a location gap of the substrate in a cassette, and the robot which conveys a substrate. It has one detection sensor which detects a location gap of said substrate while said aligner is arranged near near of said substrate so that access isolation may be carried out to the flank of said substrate, and while having the hand in which said robot holds said substrate, two substrate detection sensors are arranged in the direction which intersects perpendicularly with said hand to a travelling direction. Said one detection sensor arranged in said aligner will detect a location gap of the direction of Y of a substrate, two substrate detection sensors arranged by said robot's hand will detect a location gap of the inclination of a substrate and the direction of X, and three sensors will perform location amendment of a hand. Therefore, even if a substrate is division glass, a location gap of the side of a substrate is surely detectable by one detection sensor. Moreover, since location amendment of the hand is beforehand carried out according to the substrate which the location gap has generated in case a substrate is adsorbed, a substrate is conveyed in the condition that there are not a hand and an inclination, to migration of X shaft orientations of a hand. Therefore, from a cassette, a substrate does not interfere in a cassette, ejection or even when being contained.
[0021] moreover, the existence sensor by which this substrate transport device detects the existence of said substrate to said aligner -- said substrate -- receiving -- the upper and lower sides -- it is arranged movable. If a receipt **** cassette is installed in a predetermined location, as for said existence sensor, said substrate will perform vertical migration immediately, in order to detect the side from the substrate of an upper bed even to the substrate of a soffit. Therefore, a robot's conveyance time amount is shortened compared with the case where the robot is equipped with the existence sensor.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, glass substrate W contained by Cassette C does not restrict that the thing of the same magnitude is always contained, and since the division glass which cut the conventional glass substrate into 1/2 or 1/3 is used, in the 1st above-mentioned distance robot 51 arranged at two places, one 1st distance robot 51 may be unable to detect the side of glass substrate W. the magnitude of glass substrate W -- doubling -- each time -- the distance sensor 51 -- attaching -- things -- productivity -- falling -- making -- not only -- cost -- high -- becoming -- since -- the substrate gap detection method -- reexamination had to be aimed at.
[0005] This invention solves an above-mentioned technical problem, and aims at offering the substrate transport device which can measure detection of a location gap of a glass substrate irrespective of the magnitude of a glass substrate.

[Translation done.]

MEANS

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, it constitutes from a substrate transport device in connection with this invention as follows. Namely, a cassette which contains a substrate and an aligner which detects a location gap of a substrate in a cassette, While it is the substrate transport device which has a robot which conveys a substrate, and said aligner is arranged near near of said substrate so that access isolation may be carried out to a flank of said substrate While having one detection sensor which detects a location gap of said substrate and having a hand said whose robot holds said substrate, it is characterized by arranging two substrate detection sensors in the direction which intersects perpendicularly with said hand to a travelling direction.
[0007] moreover, an existence sensor which detects existence of said substrate to said aligner preferably -- said substrate -- receiving -- the upper and lower sides -- what is necessary is to just be characterized by being arranged movable
[0008]
[Embodiment of the Invention] Hereafter, the gestalt of 1 implementation of this invention is explained based on a drawing.
[0009] The transport device M of this gestalt has the cassette 1 which contains glass substrate (henceforth substrate) W, the aligner 2 installed near near the side of a cassette 1, and the robot 3 installed in the location which counters the transverse plane of a cassette 1.
[0010] In order to contain two or more substrates W in the vertical direction, the substrate supporter (not shown) which supports underside 4 corner of each substrate W is arranged, and a robot's 3 hand or the detection sensor of an aligner is formed in the cassette 1 possible [insertion]. And receipt of Substrate W installs a cassette 1 in the position (location shown in drawing 1) of a transport device M.
[0011] An aligner 2 has the movable detecting-element main part 23 in the direction which carries out access isolation at a cassette 1 side, showing around at the susceptor 21 and the rail 22 which have two rails 22 laid toward a cassette 1 side, and one sensor supporter 24 which projects toward a cassette 1 side on the detecting-element main part 23 is arranged movable in the vertical direction. In the sensor supporter 24, it has one location gap detection sensor (henceforth a position sensor) 25 which is made to project light and detects the side edge edge of Substrate W from the upper part or a lower part, and the substrate existence sensor (henceforth an existence sensor) 26 which is made to project light on the side of Substrate W, and detects the existence of Substrate W, and is constituted.
[0012] A robot 3 has the hand 31 connected with a rotatable arm object (graphic display ****) rotatable at **** (not shown), and two edge detection sensors 32 are arranged in the direction which carries out an abbreviation rectangular cross to a travelling direction on a hand 31. Furthermore, four adsorption holes 33 for carrying out adsorption maintenance of the substrate W are formed in a hand 31, and it connects with the vacuum generator which is not illustrated through a hose.
[0013] If the cassette 1 by which Substrate W was contained first is installed in a position, as shown in drawing 2 , this transport device M The detecting-element main part 23 advances toward a cassette 1 so that the head of the sensor supporter 24 of an aligner 2 may be located near this side of Substrate W. Vertical migration of between the substrates W which are in a soffit from the substrate which has the sensor supporter 24 of an aligner 2 in the upper bed of a cassette 1 is carried out, and actuation of the existence sensor 26 detects the existence of Substrate W. The reflective mold which senses the light which applied the projected light to the side of Substrate W, and was reflected is sufficient as this existence sensor 26, and it may also have floodlighting / light-receiving mold sensed by whether it will

shade with Substrate W by the time the light which has a projector and an electric eye on both sides of Substrate W, and was discharged from the existence sensor 26 which is a floodlight reaches an electric eye. Furthermore, the reflective mold which the detecting-element main part 23 moves under every one substrate W, turns and projects Substrate W on the upper part from a lower part, and senses Substrate W is sufficient as the existence sensor 26. In this gestalt, the reflective mold which applies light to the side of Substrate W in the location distant from the existence sensor 26 is used like drawing 1 .

[0014] After the existence sensor 26 detects the existence of Substrate W, it is made to arrange under the substrate W which it moves [substrate] in the direction which the detecting-element main part 23 approaches toward a cassette 1 side, and has a position sensor 25 conveyed, as shown in drawing 3 -4. And a position sensor 25 detects the location of the side edge edge of Substrate W. A position sensor 25 is sent to the control unit which detects the location and does not illustrate the signal by sensing the light which projected light up and was reflected on the side edge edge of Substrate W. A location gap of the direction (the direction which intersects perpendicularly to the travelling direction of a hand 31, i.e., a robot's 3 migration direction) of Y of Substrate W is called for by measurement of a position sensor 25. Termination of location detection of Substrate W moves the detecting-element main part 23 in the direction isolated from a cassette 1.

[0015] On the other hand, a robot 3 turns a hand 31 to a cassette 1 side, and he advances a hand 31 toward a cassette 1 so that you may make it located under the substrate W whose position sensor 25 has detected the side edge edge of Substrate W and to convey, at the same time it ends at the time. Under the present circumstances, if Substrate W leans to the location of normal, as shown in drawing 5 , one edge detection sensor 32 (drawing 5 Nakamigi side) will arrive at the front end edge of Substrate W between two edge detection sensors 32 first attached in the hand 31, that location will be detected, and that signal will be sent to a control unit. Next, if a hand 31 moves forward further, as shown in drawing 6 , the edge detection sensor 32 (left-hand side in drawing 5) of another side will arrive at the front end edge of Substrate W, the location will be detected, and the signal will be sent to a control unit. In addition, the type as the above-mentioned position sensor 25 with the same edge detection sensor 32 is used.

[0016] The location of the direction of X of Substrate W (travelling direction of a hand 31) and a location gap are calculated by measurement of two edge detection sensors 32, and theta is called for whenever [angle-of-inclination / of Substrate W]. As shown in drawing 7 , while location amendment of the robot 3 is carried out at the location gap part Y shaft orientations of Y shaft orientations together with a gap of the direction of Y detected by the above-mentioned position sensor 25 by this, a hand 31 is carried out theta angle correction to ****. Therefore, while being arranged to the leaning substrate W at parallel, a hand 31 will move forward the abbreviation center line top of Substrate W, as shown in drawing 8 . Advance of a hand 31 is performed with the movement magnitude to the direction of X of the part which amended the location gap of the direction of X. Therefore, in case a hand 31 arrives at the location which adsorbs Substrate W, as Substrate W will be held in a regular location and shown in drawing 9 after that, a hand 31 adsorbs Substrate W and takes out from a cassette 1.

[0017] In case Substrate W is conveyed by the hand 31, since it is conveyed in the condition that there is no inclination to a hand 31, when being taken out from a cassette, Substrate W does not interfere in the cassette itself and is conveyed smoothly. Moreover, in case degree process is equipped with Substrate W and it contains to a cassette again especially, since the hand has already adsorbed the substrate in the regular location, it can be conveyed in a regular predetermined location only by advance migration of a hand. That is, interference with the substrate and cassette which are easy to generate when containing the substrate in the condition of having inclined can be prevented.

[0018] The above-mentioned operation is repeated, alignment of all the substrates W in a cassette 1 will be carried out, and they will be conveyed by degree process.

[0019] In addition, especially the configuration of the sensor susceptor of an aligner is not above scrupulous, and one position sensor and one existence sensor should just be attached ** picking.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The flat-surface schematic diagram of the transport device by one gestalt of this invention
[Drawing 2] Outline front view showing actuation of the existence sensor arranged in the aligner of drawing 1
[Drawing 3] Outline front view showing actuation of the position sensor arranged in the aligner of drawing 1
[Drawing 4] The outline plan showing actuation of the position sensor arranged in the aligner of drawing 1
[Drawing 5] Drawing showing the operation which one edge detection sensor of a hand moves to the front end edge of a substrate
[Drawing 6] Drawing showing the operation which the edge detection sensor of another side of a hand moves to the front end edge of a substrate
[Drawing 7] Drawing showing the operation in which a hand carries out location amendment
[Drawing 8] Drawing showing the operation to which a hand moves forward further
[Drawing 9] Drawing showing the operation whose hand takes out a substrate
[Drawing 10] Drawing showing the conventional substrate transport device
[Description of Notations]
M -- Transport device
1 -- Cassette
2 -- Aligner
3 -- Robot
23 -- Detecting-element main part
24 -- Sensor supporter
25 -- Position sensor
26 -- Existence sensor
31 -- Hand
32 -- Edge detection sensor
W -- Substrate

[Translation done.]

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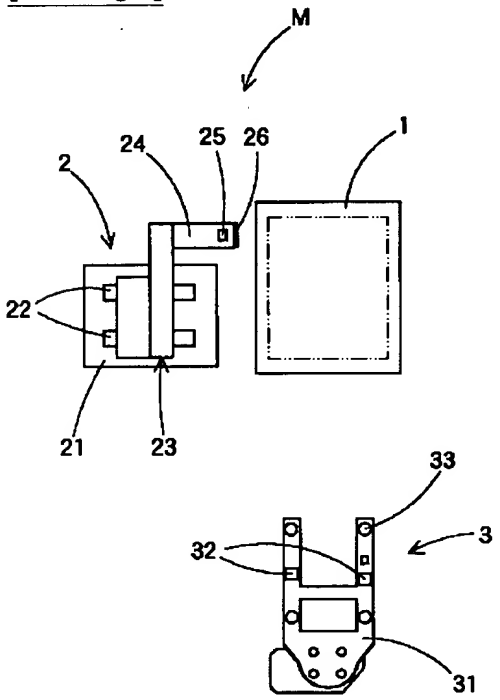
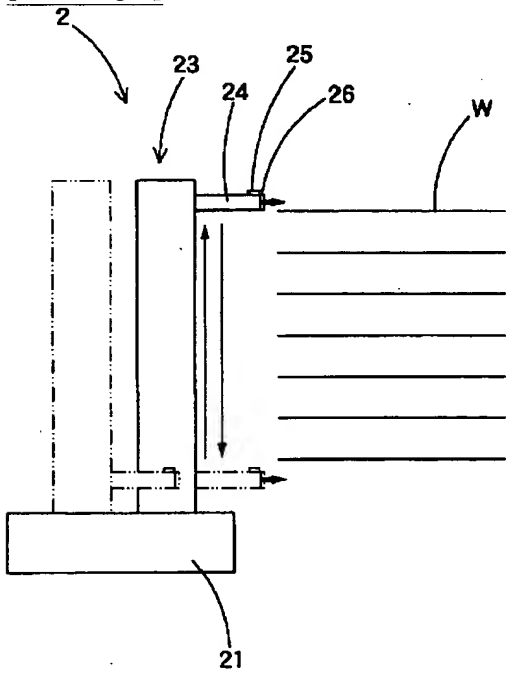
DRAWINGS

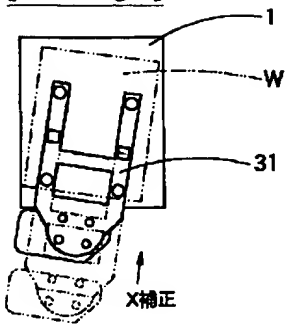
[Drawing 1]



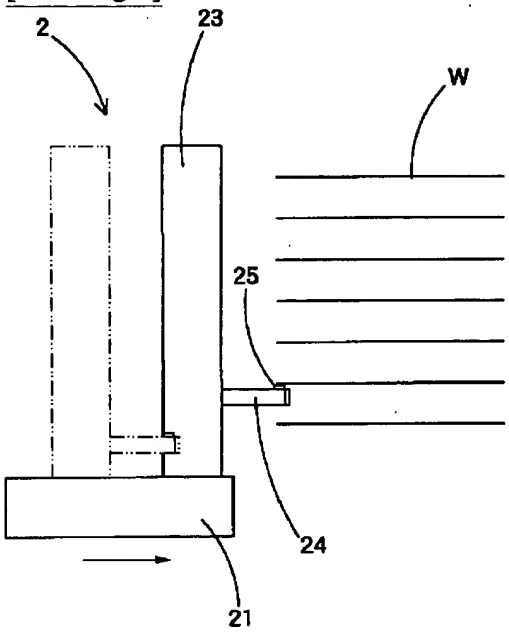
[Drawing 2]



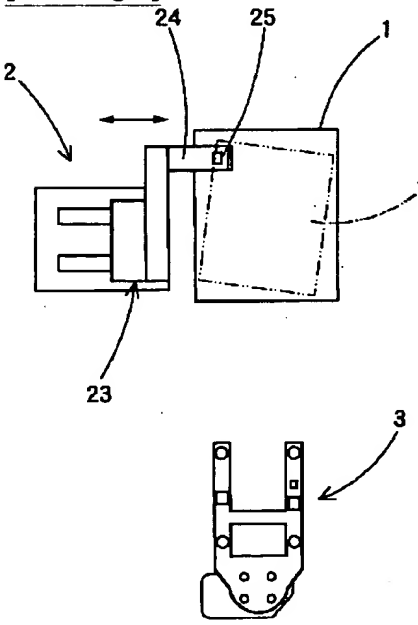
[Drawing 8]



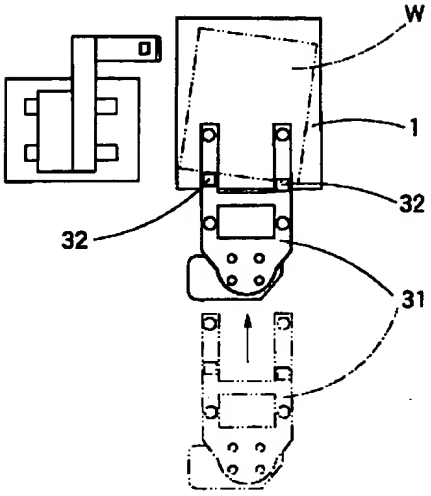
[Drawing 3]



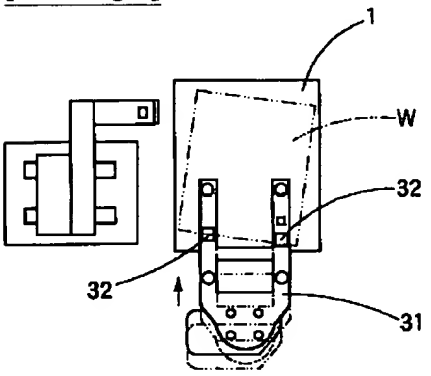
[Drawing 4]



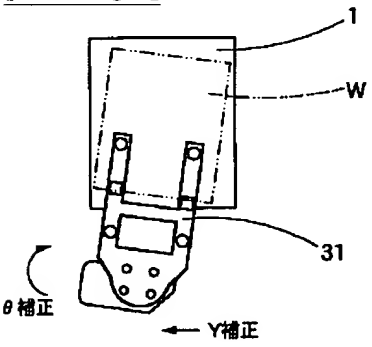
[Drawing 5]



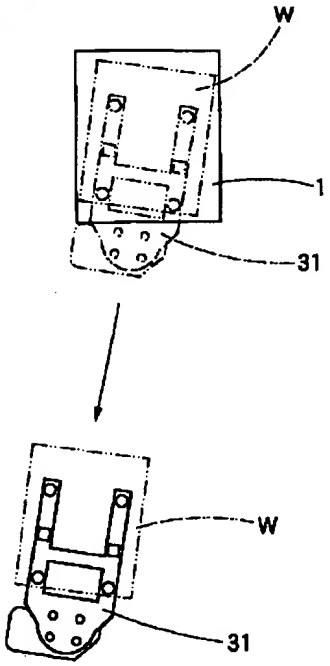
[Drawing 6]



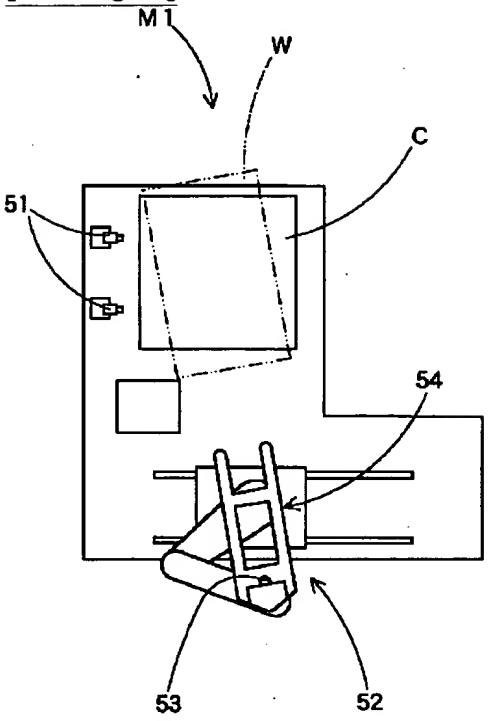
[Drawing 7]



[Drawing 9]



[Drawing 10]



[Translation done.]

10-335420
Work Aligning Apparatus

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CLAIMS

[Claim(s)]
[Claim 1] A cassette which is alignment equipment of a work conveyed to a cassette of degree process, and is arranged on a stand after it adsorbs a thin work contained by cassette and it carries out alignment, With a robot having a robot hand which is arranged possible [sliding] on a rail installed on said stand, adsorbs said work and conveys it The 1st position sensor which is arranged to a front end side of said work by said robot hand at at least two places at abbreviation parallel, and detects a location of said work front end edge to it, respectively, The 2nd position sensor which is arranged near said robot on said stand, and detects said work side edge marginal location, A control unit which inputs a signal from said 1st and 2nd position sensors, and outputs a signal to said robot, A process in which a preparation and said robot hand carry out advance migration to a predetermined adsorption location of a lower part of said work, A process which goes up after that and adsorbs a work, and a process which carries out back space migration on **** of the account robot of back to front, A process which carries out sliding migration of said rail top with the account robot of back to front, and a process which conveys a work to a cassette of degree process after that, By the time it is controlled to contain a ****** work in a process [degree] cassette and said robot hand arrives at a predetermined adsorption location of a lower part of said work When said 1st position sensor detects a front end edge of said work and said robot hand carries out sliding migration of said rail top with said robot, Alignment equipment of a work characterized by amending said hand by said control unit so that alignment of said work may be carried out to a location of normal in case said 2nd position sensor detects said work side edge and said hand conveys a work to said process [degree] cassette.
[Claim 2] Alignment equipment of a work according to claim 1 characterized by providing the following A process which moves to a location in front of a work at high speed in case said robot hand carries out advance migration at a position of a lower part of said work A process which carries out advance migration across a work front end edge from a location in front of a work by slow speed in order that said 1st position sensor may detect said work front end marginal location A process which said robot hand moves across a location of said 2nd position sensor by slow speed in order that said 2nd position sensor may detect said work side edge marginal location, in case said robot hand carries out sliding migration of said rail top with said robot including a process which carries out advance migration to a work adsorption location predetermined at a high speed
[Claim 3] Alignment equipment of a work according to claim 1 characterized by detecting a location, respectively by shading light which said 1st position sensor and 2nd position sensor are the projection mold sensor which discharges light in the vertical direction, and was projected on a front end edge and the side edge of said work.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the work alignment equipment for carrying out alignment of the work of the shape of sheet metal, such as a glass substrate used for a liquid crystal panel, and containing it.
[0002]
[Description of the Prior Art] Generally, in order to manufacture a semiconductor integrated circuit, a thin glass substrate is used. In order to pass through various kinds of processes in manufacturing a semiconductor integrated circuit, high degree of accuracy is required also of the location precision of the glass substrate at the time of between each process being conveyed and being conveyed to a glass substrate. A location gap detected by detecting the location of the actual condition of the glass substrate arranged in a cassette by a sensor etc., in case the glass substrate contained in the cassette conveys at degree process by the robot conventionally, and after sending and calculating a part for the location gap of the detected glass substrate to a control unit, the alignment equipment constituted so that the location of the normal of a glass substrate may be secured and the amendment migration of the robot hand may carry out was offered.
[0003] For example, the alignment equipment M2 shown in drawing 11 With the cassette 22 by which glass substrate W was contained, and the robot 23 stationed so that the glass substrate output port of a cassette 22 may be countered It has detection equipment 24 which is arranged near the flank of a cassette 22 and detects the flank periphery section W2 of glass substrate W, and is constituted, and 2 sets of sensors 25 are arranged at the flank periphery section W2 of glass substrate W, and parallel at detection equipment 24. A sensor 25 is moved possible [rise and fall], in order to detect the flank periphery section W2 of all glass substrate W contained two or more steps in the cassette 22, and if a cassette 22 is arranged at a position, 2 sets of sensors 25 will measure the distance of each glass substrate W. By measuring the two flank periphery sections W2 of glass substrate W, a location gap of arranged glass substrate W can be detected, and a robot 23 is ordered the amount of amendments which calculated the signal of a location gap of detected glass substrate W with delivery and a control unit 30 to the control unit 30. By the robot 23, the amount part angle of amendments will be rotated for a robot hand 26 in response to the command from a control unit 30. And it is moved in order to adsorb glass substrate W. Under the present circumstances, the sensor 27 which detects the front end side W1 of glass substrate W is prepared for the robot 23, and it was operating so that it might be moved by the need and adsorption grasping of the glass substrate W might be carried out.
[0004]
[Problem(s) to be Solved by the Invention] However, generally, an order for various kinds of things may be placed, and compact and easy alignment equipment may be ordered from the alignment equipment of a glass substrate depending on want of a user. Since above-mentioned alignment equipment M2 needs the detection equipment 24 arranged near the flank of a cassette 22 and 2 sets of sensors 25 are arranged possible [rise and fall] at the detection equipment 24, the space of the whole equipment becomes large and detection equipment itself is constituted intricately. Therefore, cost will also start substantially.
[0005] Since this invention solves an above-mentioned technical problem and the 1st object corresponds to space-saving-ization, it is being able to manufacture at compact and cheap cost, and the 2nd object is controlling to perform exact detection by the sensor, and aims at offering the alignment equipment of the

work for it while it shortens a tact time.
[0006]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, work alignment equipment by this invention A cassette which conveys to a cassette of degree process and is arranged on a stand after it adsorbs a thin work contained by cassette and it carries out alignment, With a robot having a robot hand which is arranged possible [sliding] on a rail installed on said stand, adsorbs said work and conveys it The 1st position sensor which is arranged to a front end side of said work by said robot hand at at least two places at abbreviation parallel, and detects a location of said work front end edge to it, respectively, The 2nd position sensor which is arranged near said robot on said stand, and detects said work side edge marginal location, A control unit which inputs a signal from said 1st and 2nd position sensors, and outputs a signal to said robot, A process in which a preparation and said robot hand carry out advance migration to a predetermined adsorption location of a lower part of said work, A process which goes up after that and adsorbs a work, and a process which carries out back space migration on **** of the account robot of back to front, A process which carries out sliding migration of said rail top with the account robot of back to front, and a process which conveys a work to a cassette of degree process after that, By the time it is controlled to contain a ****** work in a process [degree] cassette and said robot hand arrives at a predetermined adsorption location of a lower part of said work When said 1st position sensor detects a front end edge of said work and said robot hand carries out sliding migration of said rail top with said robot, In case said 2nd position sensor detects said work side edge and said hand conveys a work to said process [degree] cassette, it is characterized by amending said hand by said control unit, so that alignment of said work may be carried out to a location of normal.

[0007] Moreover, a process which moves to a location in front of a work preferably at high speed in case said hand carries out advance migration at a position of a lower part of said work, A process which carries out advance migration across a work front end edge from a location in front of a work by slow speed in order that said 1st position sensor may detect said work front end marginal location, In case said robot hand carries out sliding migration of said rail top with said robot including a process which carries out advance migration to a work adsorption location predetermined at a high speed, in order that said 2nd position sensor may detect said work side edge marginal location What is necessary is to just be characterized by including a process which said robot hand moves across a location of said 2nd position sensor by slow speed.
[0008] Still more preferably, said 1st position sensor and 2nd position sensor are the projection mold sensor which discharges light in the vertical direction, and it may be characterized by detecting a location, respectively by shading light projected on a front end edge and the side edge of said work.
[0009]
[Embodiment of the Invention] Hereafter, the gestalt of 1 implementation of this invention is explained based on a drawing.
[0010] The alignment equipment (henceforth alignment equipment) M of the work of this gestalt The cassette 3 which is laid in a stand 1 and carries out receipt maintenance of the rectangular plate-like glass substrate W as a work as shown in drawing 1 , With the robot 5 which conveys to the process [degree] cassette 15 which goes up and down glass substrate W, and is arranged next to a cassette 3 by abbreviation parallel It has the rail 10 to which it shows a robot 5 possible [sliding] while being installed by a cassette 3, the process [degree] cassette 15, and parallel on a stand 1, and the control unit 20 which controls a robot's 5 actuation, and is constituted.
[0011] A cassette 3 is laid on the stand 1 of Equipment M, is a receipt cassette which can contain glass substrate W, and is laid by two or more steps support Kataue by whom glass substrate W is countered and formed in the longitudinal direction in a cassette 3 and who does not illustrate.
[0012] while a robot 5 is stationed possible [sliding of on a rail 10], equipping the upper part with the arm section 8 which has the robot hand (henceforth a hand) 7 which carries out adsorption conveyance of the glass substrate W and constituting the arm section 8 possible [telescopic motion] -- the robot-aircraft base 9 -- receiving -- rotation and the upper and lower sides -- it is arranged movable. Moreover, two or more places are formed, it connects with the adsorption air circuit which is not illustrated, and a hand 7 requires the adsorption hole which adsorbs glass substrate W for a hand 7 while being formed in the shape of a fork.
[0013] Moreover, to the front end side of glass substrate W, two places and the 1st position sensor 11-11

are laid under the upper surface of a hand 7, and are attached in the point upper surface of a hand 7 at abbreviation parallel (the inside of drawing, longitudinal direction). The 1st position sensor 11 is projected toward the upper part using light, such as laser, when the front end edge W1 of glass substrate W shades, it measures the location of the front end edge W1 of glass substrate W, respectively, and it outputs the electrical signal according to the location to a control unit 20.

[0014] And in a control unit 20, the amount of angle gaps to the location (X1, X2) from the robot center position of the glass substrate W front end edge measured by the 1st two position sensor 11 and a predetermined location [in / the amount of location gaps (deltaX) detected by the 1st two position sensor 11-11 is computed, and / plane view] is computed, the amount of amendments is calculated, and it outputs to a robot.

[0015] Moreover, the 2nd position sensor 13 for a robot 5 to measure one side edge edge W2 of glass substrate W through the susceptor which is not illustrated from a stand 1 near the robot 5 in the location which counters a cassette 3 is attached. The 2nd position sensor 13 is arranged so that light can be projected toward the upper part. And when glass substrate W is moved to a hand 7 by a robot's home position after adsorption, and the left side edge edge W2 of glass substrate W shades, the location (amount of location gaps deltaY to the location of normal) of the left side edge edge W2 of glass substrate W is measured, and the electrical signal according to the location is outputted to a control unit 20.

[0016] A transparency type photosensor and a reflective type photosensor are sufficient as the 1st position sensor 11 and the 2nd position sensor 13, and they may use an optical switch and an optical type licenser. And the location measured by the location detection sensor is checked with a control unit 20, a location gap of the longitudinal direction to the position of glass substrate W is computed, a robot's 5 migration assistant conditioned-weight deltaY is calculated, and it outputs to a robot 5.

[0017] Next, an operation of the alignment equipment M constituted as mentioned above is explained.

[0018] The cassette 3 which contained glass substrate W is arranged at Equipment M, and goes up and down according to the location of glass substrate W which conveys a hand 7 (drawing 1). The location of this hand 7 is made into a home position P1, after that, glass substrate W of a cassette 3 goes caudad, and a hand 7 moves forward. In this process, a hand 7 moves at high speed from the home position P1 to the location P2 in front of glass substrate W (refer to drawing 2), and moves by slow speed to the location P3 carried out for a while across the front end edge of glass substrate W from the location of P2 (drawing 3 - 4 reference). During this slow speed migration, when the front end edge W1 of glass substrate W shades the light floodlighted from the 1st position sensor 11-11, light is reflected, and the location of the front end edge W1 of glass substrate W can be measured (refer to drawing 4). And a hand 7 moves from the location of a hand seven P3 to the location P4 which adsorbs glass substrate W at high speed (refer to drawing 5). Therefore, while being moved even to the predetermined lower part location of glass substrate W from a home position, a hand 7 will move by slow speed, when measuring the location of glass substrate W, and will move at high speed except it. And the location of measured glass substrate W is memorized within a control unit 20 as it is.

[0019] Next, it goes up slowly in the location of a hand seven P4, glass substrate W is adsorbed with the adsorber which will not be illustrated if the underside of glass substrate W is contacted, and small lifting is carried out further (adsorption process).

[0020] Then, back space migration is carried out from the location of a hand seven P4 to a home position P1 by high-speed motion (refer to drawing 6). And the hand 7 which returned to the home position P1 moves leftward with a robot 5 in a rail 10 top by the motion [slow speed / to a location P5] which the left side edge edge W2 of glass substrate W passed the 2nd position sensor 13, and was carried out for a while (drawing 7 - 8 reference). During this slow speed migration, in case the left side edge edge W2 of Work W passes through a sensor 13 top, it will reflect, when Work W shades the light to the upper part [sensor / 13] on which it was projected, and the location of the work W side edge edge W2 will be measured (refer to drawing 8). The location of the side edge edge W2 of the measured work W is memorized within a control unit 20 as it is.

[0021] In order to contain glass substrate W to the process [degree] cassette 15, the hand 7 which moved to the location of P5 moves in the rail 10 top arranged on a stand 1 the robot 5 whole main part, and moves to the location P6 which counters the process [degree] cassette 15. In case [this] it moves, a robot 5 stops in the location which amended a part for amount of location gaps delta[of the side edge edge W2 of the work W calculated with the control unit 20] Y (the amount of location gaps to the

location of normal) (refer to drawing 9).
[0022] Then, a hand 7 carries out advance migration toward the process [degree] cassette 15 at high speed, where glass substrate W is adsorbed, and it contains glass substrate W to a process [degree] cassette (refer to drawing 10). In this process, in order to contain glass substrate W to the process [degree] cassette 15 in the location of normal, a part for amount of location gaps deltaX of the front end side W1 of glass substrate W measured by the sensor 11 is performed by amending the angle of a hand 7.
[0023] The operation of this amount of amendments is performed within a control unit 20. It is distance with glass substrate W in the condition of being contained by each 1st position sensor 11 and 11 and cassette 3 X1 and X2 When it carries out, the gap X of right and left of glass substrate W is expressed with X=|X1-X2 |. Moreover, when distance between 1st position-sensor 11A and 11B is set to Z, angle-of-inclination theta of the gap to the predetermined location of the work side is expressed with tan theta=X/Z. Angle correction of a hand 7 is performed by rotating angle-of-inclination theta to **** 9.
[0024] In this way, by the hand 7, sequential adsorption is carried out from a top, and all glass substrate W contained by the cassette 3 in two or more steps has a location corrected, and is conveyed and contained by the process [degree] cassette 15.
[0025] Therefore, when a sensor detects, a hand 7 moves in slow speed, and since all sensors are arranged at the robot side, while being able to constitute from alignment equipment 1 of this gestalt in a compact, since others move at high speed, they shorten a tact time and can perform detection accurate again.
[0026] The movement toward a hand 7 may not be restricted to ****, and may be other gestalten. For example, in case [in which a hand 7 carries out back space migration depending on the installation location of the 2nd position sensor 13] it carries out, it may not be a home position P1, or you may make it return to a front location from a home position P1. In that case, a robot 5 should just move in a rail 10 top with the location.
[0027] Moreover, if a hand 7 is moved by slow speed motion when high-speed migration is carried out just before the process [degree] cassette 15 and glass substrate W inserts into the process [degree] cassette 15 in case a hand 7 contains glass substrate W to the process [degree] cassette 15, glass substrate W can be contained more safely.
[0028] In addition, the process [degree] cassette 15 can also be installed in the opposite hand of a cassette 3 on both sides of a robot 5. Moreover, especially the location where the process [degree] cassette 15 is arranged is not limited, and should just amend movement magnitude according to the location arranged.
[0029]
[Effect of the Invention] As mentioned above, as for alignment equipment, according to this invention, the 2nd one position sensor by which the 1st two position sensor has been arranged and was supported by a robot's hand near said robot at the stand is arranged. The 1st two position sensor detects the front end edge of said work, the electrical signal based on the location is inputted into a control unit, and the 2nd position sensor arranged in said robot's **** detects the side edge edge of a work, and inputs the electrical signal based on the location into a control unit. Therefore, compared with the former, since this alignment equipment does not need detection equipment different from a robot, it can be constituted in a compact, and it can attain space-saving-ization. Moreover, said robot hand contains a work to a process [degree] cassette through the process which carries out advance migration, the process which adsorbs a work, the process which carries out back space migration on said robot's ****, the process which carries out sliding migration of the rail top with said robot, and the process which conveys said work to the cassette of degree process to the predetermined location of the lower part of said work. In case said 1st position sensor detects the location of a work front end edge in case said robot hand carries out advance migration in the predetermined location of a work lower part, and said robot hand moves with a robot in said rail top, said 2nd position sensor detects the location of the side edge edge of a work. And in case said robot hand conveys a work to a process [degree] cassette, said robot hand is amended by the control unit and contains a work to a process [degree] cassette. Therefore, since it controls to perform alignment amendment of a robot hand during work conveyance, a tact time can be shortened, and productivity can be improved.
[0030] Moreover, since said robot hand is controlled to move to slow speed in case said 1st position sensor and 2nd position sensor pass the edge of a work, it can detect a work location with a sufficient

precision.
[0031] Furthermore, since it is constituted so that the location of a work may be detected, when said sensor projects light toward the upper part and a work shades light, location detection of a work can be ensured [easily and].

[Translation done.]

TECHNICAL FIELD

[Industrial Application] This invention relates to the work alignment equipment for carrying out alignment of the work of the shape of sheet metal, such as a glass substrate used for a liquid crystal panel, and containing it.

[Translation done.]

PRIOR ART

[Description of the Prior Art] Generally, in order to manufacture a semiconductor integrated circuit, a thin glass substrate is used. In order to pass through various kinds of processes in manufacturing a semiconductor integrated circuit, high degree of accuracy is required also of the location precision of the glass substrate at the time of between each process being conveyed and being conveyed to a glass substrate. A location gap detected by detecting the location of the actual condition of the glass substrate arranged in a cassette by a sensor etc., in case the glass substrate contained in the cassette conveys at degree process by the robot conventionally, and after sending and calculating a part for the location gap of the detected glass substrate to a control unit, the alignment equipment constituted so that the location of the normal of a glass substrate may be secured and the amendment migration of the robot hand may carry out was offered.
[0003] For example, the alignment equipment M2 shown in drawing 11 With the cassette 22 by which glass substrate W was contained, and the robot 23 stationed so that the glass substrate output port of a cassette 22 may be countered It has detection equipment 24 which is arranged near the flank of a cassette 22 and detects the flank periphery section W2 of glass substrate W, and is constituted, and 2 sets of sensors 25 are arranged at the flank periphery section W2 of glass substrate W, and parallel at detection equipment 24. A sensor 25 is moved possible [rise and fall], in order to detect the flank periphery section W2 of all glass substrate W contained two or more steps in the cassette 22, and if a cassette 22 is arranged at a position, 2 sets of sensors 25 will measure the distance of each glass substrate W. By measuring the two flank periphery sections W2 of glass substrate W, a location gap of arranged glass substrate W can be detected, and a robot 23 is ordered the amount of amendments which calculated the signal of a location gap of detected glass substrate W with delivery and a control unit 30 to the control unit 30. By the robot 23, the amount part angle of amendments will be rotated for a robot hand 26 in response to the command from a control unit 30. And it is moved in order to adsorb glass substrate W. Under the present circumstances, the sensor 27 which detects the front end side W1 of glass substrate W is prepared for the robot 23, and it was operating so that it might be moved by the need and adsorption grasping of the glass substrate W might be carried out.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, as for alignment equipment, according to this invention, the 2nd one position sensor by which the 1st two position sensor has been arranged and was supported by a robot's hand near said robot at the stand is arranged. The 1st two position sensor detects the front end edge of said work, the electrical signal based on the location is inputted into a control unit, and the 2nd position sensor arranged in said robot's **** detects the side edge edge of a work, and inputs the electrical signal based on the location into a control unit. Therefore, compared with the former, since this alignment equipment does not need detection equipment different from a robot, it can be constituted in a compact, and it can attain space-saving-ization. Moreover, said robot hand contains a work to a process [degree] cassette through the process which carries out advance migration, the process which adsorbs a work, the process which carries out back space migration on said robot's ****, the process which carries out sliding migration of the rail top with said robot, and the process which conveys said work to the cassette of degree process to the predetermined location of the lower part of said work. In case said 1st position sensor detects the location of a work front end edge in case said robot hand carries out advance migration in the predetermined location of a work lower part, and said robot hand moves with a robot in said rail top, said 2nd position sensor detects the location of the side edge edge of a work. And in case said robot hand conveys a work to a process [degree] cassette, said robot hand is amended by the control unit and contains a work to a process [degree] cassette. Therefore, since it controls to perform alignment amendment of a robot hand during work conveyance, a tact time can be shortened, and productivity can be improved.
[0030] Moreover, since said robot hand is controlled to move to slow speed in case said 1st position sensor and 2nd position sensor pass the edge of a work, it can detect a work location with a sufficient precision.
[0031] Furthermore, since it is constituted so that the location of a work may be detected, when said sensor projects light toward the upper part and a work shades light, location detection of a work can be ensured [easily and].

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, generally, an order for various kinds of things may be placed, and compact and easy alignment equipment may be ordered from the alignment equipment of a glass substrate depending on want of a user. Since above-mentioned alignment equipment M2 needs the detection equipment 24 arranged near the flank of a cassette 22 and 2 sets of sensors 25 are arranged possible [rise and fall] at the detection equipment 24, the space of the whole equipment becomes large and detection equipment itself is constituted intricately. Therefore, cost will also start substantially.
[0005] Since this invention solves an above-mentioned technical problem and the 1st object corresponds to space-saving-ization, it is being able to manufacture at compact and cheap cost, and the 2nd object is controlling to perform exact detection by the sensor, and aims at offering the alignment equipment of the work for it while it shortens a tact time.

[Translation done.]

MEANS

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, work alignment equipment by this invention A cassette which conveys to a cassette of degree process and is arranged on a stand after it adsorbs a thin work contained by cassette and it carries out alignment, With a robot having a robot hand which is arranged possible [sliding] on a rail installed on said stand, adsorbs said work and conveys it The 1st position sensor which is arranged to a front end side of said work by said robot hand at at least two places at abbreviation parallel, and detects a location of said work front end edge to it, respectively, The 2nd position sensor which is arranged near said robot on said stand, and detects said work side edge marginal location, A control unit which inputs a signal from said 1st and 2nd position sensors, and outputs a signal to said robot, A process in which a preparation and said robot hand carry out advance migration to a predetermined adsorption location of a lower part of said work, A process which goes up after that and adsorbs a work, and a process which carries out back space migration on **** of the account robot of back to front, A process which carries out sliding migration of said rail top with the account robot of back to front, and a process which conveys a work to a cassette of degree process after that, By the time it is controlled to contain a ****** work in a process [degree] cassette and said robot hand arrives at a predetermined adsorption location of a lower part of said work When said 1st position sensor detects a front end edge of said work and said robot hand carries out sliding migration of said rail top with said robot, In case said 2nd position sensor detects said work side edge and said hand conveys a work to said process [degree] cassette, it is characterized by amending said hand by said control unit, so that alignment of said work may be carried out to a location of normal.

[0007] Moreover, a process which moves to a location in front of a work preferably at high speed in case said hand carries out advance migration at a position of a lower part of said work, A process which carries out advance migration across a work front end edge from a location in front of a work by slow speed in order that said 1st position sensor may detect said work front end marginal location, In case said robot hand carries out sliding migration of said rail top with said robot including a process which carries out advance migration to a work adsorption location predetermined at a high speed, in order that said 2nd position sensor may detect said work side edge marginal location What is necessary is to just be characterized by including a process which said robot hand moves across a location of said 2nd position sensor by slow speed.
[0008] Still more preferably, said 1st position sensor and 2nd position sensor are the projection mold sensor which discharges light in the vertical direction, and it may be characterized by detecting a location, respectively by shading light projected on a front end edge and the side edge of said work.
[0009]
[Embodiment of the Invention] Hereafter, the gestalt of 1 implementation of this invention is explained based on a drawing.
[0010] The alignment equipment (henceforth alignment equipment) M of the work of this gestalt The cassette 3 which is laid in a stand 1 and carries out receipt maintenance of the rectangular plate-like glass substrate W as a work as shown in drawing 1 , With the robot 5 which conveys to the process [degree] cassette 15 which goes up and down glass substrate W, and is arranged next to a cassette 3 by abbreviation parallel It has the rail 10 to which it shows a robot 5 possible [sliding] while being installed by a cassette 3, the process [degree] cassette 15, and parallel on a stand 1, and the control unit 20 which controls a robot's 5 actuation, and is constituted.

[0011] A cassette 3 is laid on the stand 1 of Equipment M, is a receipt cassette which can contain glass substrate W, and is laid by two or more steps support Kataue by whom glass substrate W is countered and formed in the longitudinal direction in a cassette 3 and who does not illustrate.
[0012] while a robot 5 is stationed possible [sliding of on a rail 10], equipping the upper part with the arm section 8 which has the robot hand (henceforth a hand) 7 which carries out adsorption conveyance of the glass substrate W and constituting the arm section 8 possible [telescopic motion] -- the robot-aircraft base 9 -- receiving -- rotation and the upper and lower sides -- it is arranged movable. Moreover, two or more places are formed, it connects with the adsorption air circuit which is not illustrated, and a hand 7 requires the adsorption hole which adsorbs glass substrate W for a hand 7 while being formed in the shape of a fork.
[0013] Moreover, to the front end side of glass substrate W, two places and the 1st position sensor 11-11 are laid under the upper surface of a hand 7, and are attached in the point upper surface of a hand 7 at abbreviation parallel (the inside of drawing, longitudinal direction). The 1st position sensor 11 is projected toward the upper part using light, such as laser, when the front end edge W1 of glass substrate W shades, it measures the location of the front end edge W1 of glass substrate W, respectively, and it outputs the electrical signal according to the location to a control unit 20.
[0014] And in a control unit 20, the amount of angle gaps to the location (X1, X2) from the robot center position of the glass substrate W front end edge measured by the 1st two position sensor 11 and a predetermined location [in / the amount of location gaps (deltaX) detected by the 1st two position sensor 11-11 is computed, and / plane view] is computed, the amount of amendments is calculated, and it outputs to a robot.
[0015] Moreover, the 2nd position sensor 13 for a robot 5 to measure one side edge edge W2 of glass substrate W through the susceptor which is not illustrated from a stand 1 near the robot 5 in the location which counters a cassette 3 is attached. The 2nd position sensor 13 is arranged so that light can be projected toward the upper part. And when glass substrate W is moved to a hand 7 by a robot's home position after adsorption, and the left side edge edge W2 of glass substrate W shades, the location (amount of location gaps deltaY to the location of normal) of the left side edge edge W2 of glass substrate W is measured, and the electrical signal according to the location is outputted to a control unit 20.
[0016] A transparency type photosensor and a reflective type photosensor are sufficient as the 1st position sensor 11 and the 2nd position sensor 13, and they may use an optical switch and an optical type licenser. And the location measured by the location detection sensor is checked with a control unit 20, a location gap of the longitudinal direction to the position of glass substrate W is computed, a robot's 5 migration assistant conditioned-weight deltaY is calculated, and it outputs to a robot 5.
[0017] Next, an operation of the alignment equipment M constituted as mentioned above is explained.
[0018] The cassette 3 which contained glass substrate W is arranged at Equipment M, and goes up and down according to the location of glass substrate W which conveys a hand 7 (drawing 1). The location of this hand 7 is made into a home position P1, after that, glass substrate W of a cassette 3 goes caudad, and a hand 7 moves forward. In this process, a hand 7 moves at high speed from the home position P1 to the location P2 in front of glass substrate W (refer to drawing 2), and moves by slow speed to the location P3 carried out for a while across the front end edge of glass substrate W from the location of P2 (drawing 3 - 4 reference). During this slow speed migration, when the front end edge W1 of glass substrate W shades the light floodlighted from the 1st position sensor 11-11, light is reflected, and the location of the front end edge W1 of glass substrate W can be measured (refer to drawing 4). And a hand 7 moves from the location of a hand seven P3 to the location P4 which adsorbs glass substrate W at high speed (refer to drawing 5). Therefore, while being moved even to the predetermined lower part location of glass substrate W from a home position, a hand 7 will move by slow speed, when measuring the location of glass substrate W, and will move at high speed except it. And the location of measured glass substrate W is memorized within a control unit 20 as it is.
[0019] Next, it goes up slowly in the location of a hand seven P4, glass substrate W is adsorbed with the adsorber which will not be illustrated if the underside of glass substrate W is contacted, and small lifting is carried out further (adsorption process).
[0020] Then, back space migration is carried out from the location of a hand seven P4 to a home position P1 by high-speed motion (refer to drawing 6). And the hand 7 which returned to the home position P1 moves leftward with a robot 5 in a rail 10 top by the motion [slow speed / to a location P5]

which the left side edge edge W2 of glass substrate W passed the 2nd position sensor 13, and was carried out for a while (drawing 7 - 8 reference). During this slow speed migration, in case the left side edge edge W2 of Work W passes through a sensor 13 top, it will reflect, when Work W shades the light to the upper part [sensor / 13] on which it was projected, and the location of the work W side edge edge W2 will be measured (refer to drawing 8). The location of the side edge edge W2 of the measured work W is memorized within a control unit 20 as it is.

[0021] In order to contain glass substrate W to the process [degree] cassette 15, the hand 7 which moved to the location of P5 moves in the rail 10 top arranged on a stand 1 the robot 5 whole main part, and moves to the location P6 which counters the process [degree] cassette 15. In case [this] it moves, a robot 5 stops in the location which amended a part for amount of location gaps delta[of the side edge edge W2 of the work W calculated with the control unit 20] Y (the amount of location gaps to the location of normal) (refer to drawing 9).

[0022] Then, a hand 7 carries out advance migration toward the process [degree] cassette 15 at high speed, where glass substrate W is adsorbed, and it contains glass substrate W to a process [degree] cassette (refer to drawing 10). In this process, in order to contain glass substrate W to the process [degree] cassette 15 in the location of normal, a part for amount of location gaps deltaX of the front end side W1 of glass substrate W measured by the sensor 11 is performed by amending the angle of a hand 7.

[0023] The operation of this amount of amendments is performed within a control unit 20. It is distance with glass substrate W in the condition of being contained by each 1st position sensor 11 and 11 and cassette 3 X1 and X2 When it carries out, the gap X of right and left of glass substrate W is expressed with X=|X1-X2 |. Moreover, when distance between 1st position-sensor 11A and 11B is set to Z, angle-of-inclination theta of the gap to the predetermined location of the work side is expressed with tan theta=X/Z. Angle correction of a hand 7 is performed by rotating angle-of-inclination theta to **** 9.

[0024] In this way, by the hand 7, sequential adsorption is carried out from a top, and all glass substrate W contained by the cassette 3 in two or more steps has a location corrected, and is conveyed and contained by the process [degree] cassette 15.

[0025] Therefore, when a sensor detects, a hand 7 moves in slow speed, and since all sensors are arranged at the robot side, while being able to constitute from alignment equipment 1 of this gestalt in a compact, since others move at high speed, they shorten a tact time and can perform detection accurate again.

[0026] The movement toward a hand 7 may not be restricted to ****, and may be other gestalten. For example, in case [in which a hand 7 carries out back space migration depending on the installation location of the 2nd position sensor 13] it carries out, it may not be a home position P1, or you may make it return to a front location from a home position P1. In that case, a robot 5 should just move in a rail 10 top with the location.

[0027] Moreover, if a hand 7 is moved by slow speed motion when high-speed migration is carried out just before the process [degree] cassette 15 and glass substrate W inserts into the process [degree] cassette 15 in case a hand 7 contains glass substrate W to the process [degree] cassette 15, glass substrate W can be contained more safely.

[0028] In addition, the process [degree] cassette 15 can also be installed in the opposite hand of a cassette 3 on both sides of a robot 5. Moreover, especially the location where the process [degree] cassette 15 is arranged is not limited, and should just amend movement magnitude according to the location arranged.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The plan showing the work alignment equipment by the gestalt of 1 operation of this invention
[Drawing 2] Drawing showing an operation of the hand in drawing 1 (condition which moved just before the glass substrate)
[Drawing 3] Drawing showing an operation of the hand in drawing 1 (condition which passed through the front end edge of a glass substrate)
[Drawing 4] Drawing showing an operation of the hand in drawing 1 (condition of detecting the location of a glass substrate)
[Drawing 5] Drawing showing an operation of the hand in drawing 1 (condition which arrived at the adsorption location)
[Drawing 6] Drawing showing an operation of the hand in drawing 1 (condition which retreated to the home position)
[Drawing 7] Drawing showing an operation of the hand in drawing 1 (condition which passed through the side edge edge of a glass substrate)
[Drawing 8] Drawing showing an operation of the hand in drawing 1 (condition of detecting the location of a glass substrate)
[Drawing 9] Drawing showing an operation of the hand in drawing 1 (condition which moved to the location which counters a process [degree] cassette)
[Drawing 10] Drawing showing an operation of the hand in drawing 1 (condition which contained the glass substrate)
[Drawing 11] Drawing showing conventional alignment equipment
[Description of Notations]
1 -- Stand
3 -- Cassette
5 -- Robot
7 -- Robot hand
10 -- Rail
11 -- The 1st position sensor
13 -- The 2nd position sensor
15 -- Process [degree] cassette
20 -- Control unit
W -- Glass substrate (work)
W1 -- Front end edge
W2 -- Side edge edge
M -- Alignment equipment

[Translation done.]

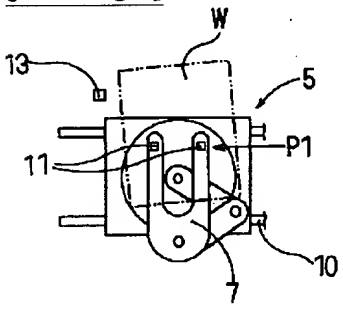
* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

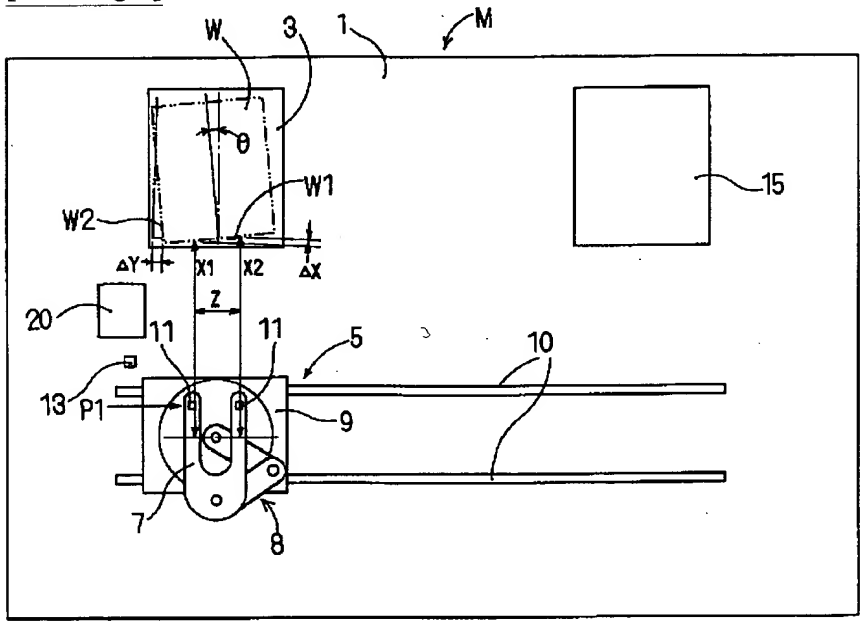
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

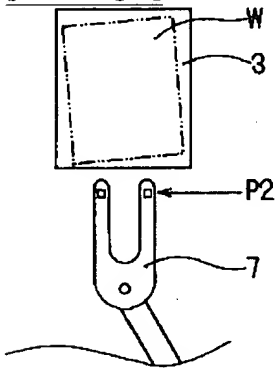
[Drawing 6]



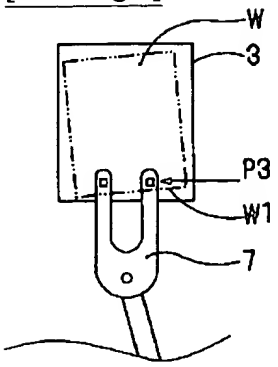
[Drawing 1]



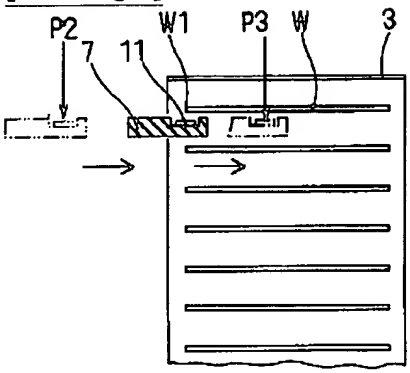
[Drawing 2]



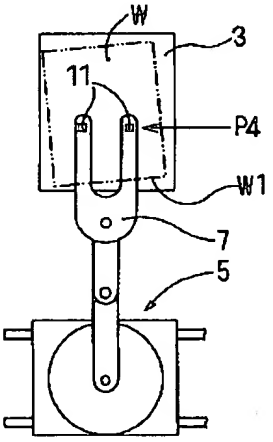
[Drawing 3]



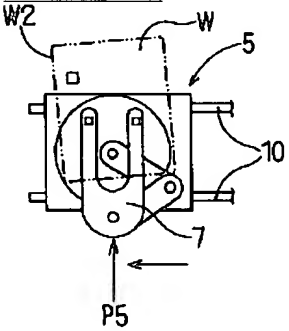
[Drawing 4]



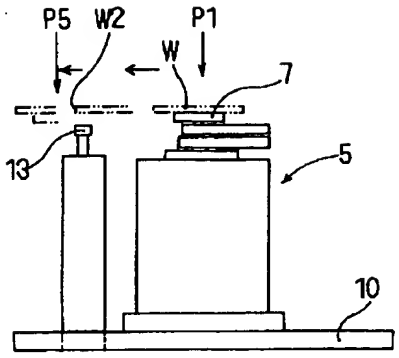
[Drawing 5]



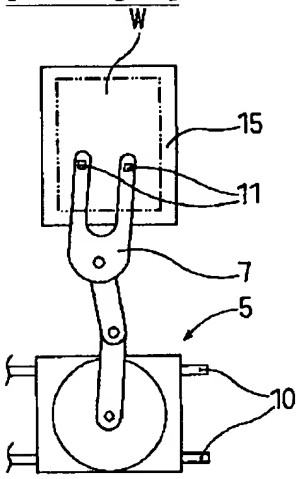
[Drawing 7]



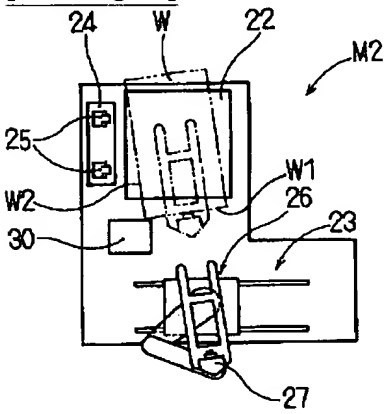
[Drawing 8]



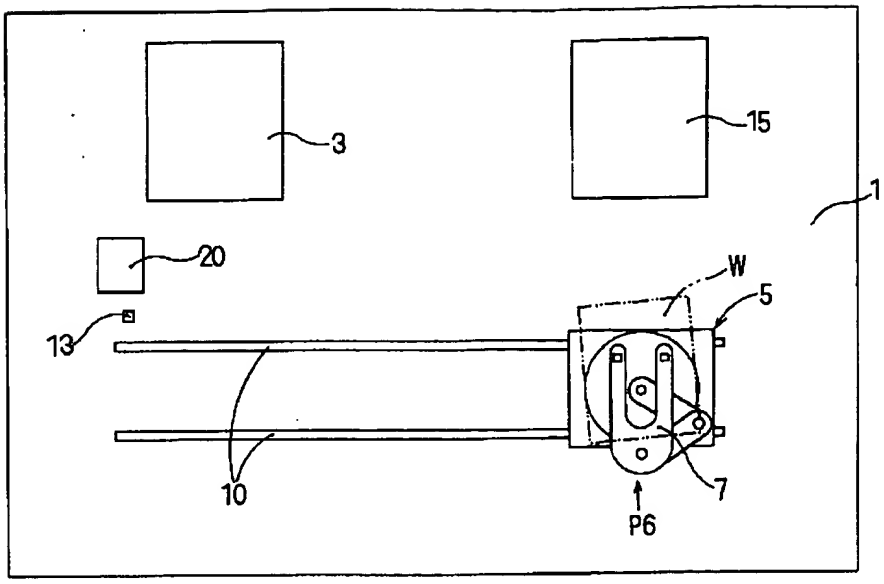
[Drawing 10]



[Drawing 11]



[Drawing 9]



[Translation done.]